THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXV. No. 1656.] LONDON, FEBRUARY 5, 1895. [47TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1½ to 12 IN. BORE.

THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.
GLASGOW OFFICE: 24, GEORGE SQUARE.
Telegrams:
"BONLEA, STOCKTON-ON-TEES."
"SPRINGBANK, GLASGOW."

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.

WOLSTON'S
TORBAY PAINTS
Special Quotations to Gas Companies.
DARTMOUTH, DEVON.

Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL AND GAS COALS.
Quotations and Analysis on Application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

THE "C" BURNER.
NEW HIGH-POWER GAS-LIGHT.
INCANDESCENT GAS-LIGHT SYSTEM.

Consumes 3¾ cubic feet per hour.

Gives a light of 70 to 80 candle power.

Brilliant Light.

Perfectly Steady and Noiseless.

Smokeless.

Reduced Heat.

The Ordinary Burner, with Special Globes, is suitable for Lighting Private Houses, Public Houses, Restaurants, Shops, &c.

Special Lamps constructed for Outside Lighting and Street Lighting; and Large Clusters of Lights made for Lighting Halls and large Areas from one centre.

Can be attached to any Gas-Fittings.

THE TRIUMPH OF GAS OVER ELECTRIC LIGHT.

Taking Gas at 3s. per 1000 cubic feet and Electric Light at 8d. per Board of Trade unit, the "C" Burner will produce an equal amount of light at **One-eighth the cost of Electric Light.** This cannot be disproved.

Substantial and Pushing Sole Agents wanted in each Town using Gas.

For Terms and Particulars, apply to the Manager of

THE INCANDESCENT GAS-LIGHT COMPANY, Ltd.,
14, PALMER STREET, WESTMINSTER, LONDON,
Near St. James's Park Station.

SAWER & PURVES, Garratt St. Works, MANCHESTER,

MANUFACTURERS OF

IMPROVED WET GAS-METERS IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

IMPROVED DRY GAS-METERS.

Speciality: PATENT CASH PREPAYMENT METERS.

CATALOGUE SENT ON APPLICATION.

PUMPS FOR GAS & WATER WORKS.

FIRST AWARDS EVERYWHERE.

TELEGRAMS: "EVANS WOLVERHAMPTON."

TRADE MARK.

APPLY FOR CATALOGUE NO. 8.

(No Trappets.)

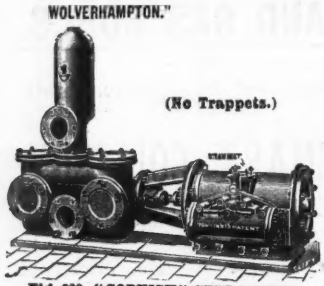


Fig. 600. "CORNISH" STEAM-PUMP FOR WATER.

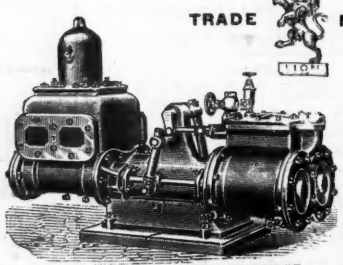


Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

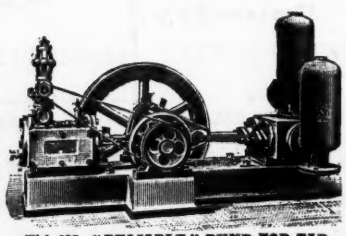


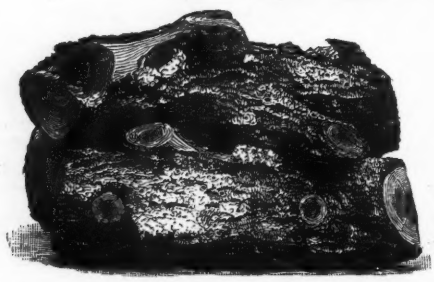
Fig. 685. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

Fig. 708. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

JOSEPH EVANS & SONS, Hydraulic Engineers,

WOLVERHAMPTON. LONDON OFFICE: 16, Union Court, Old Broad Street, E.C.

GAS-FIRES.



The LOG WOOD Gas-Fire.

COMPACT, CLEAN, AND CHEERFUL.

Two Sizes—viz., 14 in. and 16 in. long.

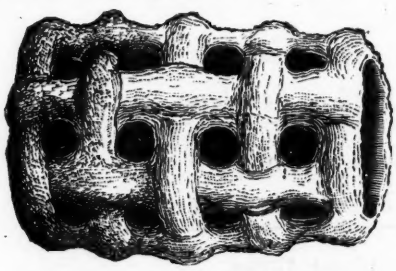
These **GAS-FIRES** are made in one piece, and of Fire-Clay, and have the exact resemblance of **Genuine Logs of Wood.**

They have perforated holes, and when lighted have the remarkably striking appearance of

BURNING LOGS OF WOOD.

They are easily fixed, simply requiring to be connected to an ordinary gas-pipe, or by means of a flexible tube enabling them to be placed in the grate or on tiles.

They fit almost any grate, and have a remarkably **cheerful appearance**, calling to mind the old-fashioned Log-Wood Fires of our forefathers.



NEW REGISTERED

BASKET PATTERN

ASBESTOS FUEL.

This Pattern Fuel has been specially designed and registered, and can be confidently recommended as the **most Efficient Gas Fuel in the Market.** Each piece has **24** holes (about twice as many as any other pattern). The increased quantity of holes giving a greater draught, the fuel is therefore heated quicker. It is also cleaner and neater in appearance than any other pattern.

Complete Catalogue and Prices on application (the Trade only).

FALK, STADELMANN, & CO., LD.

VERITAS LAMP WORKS,

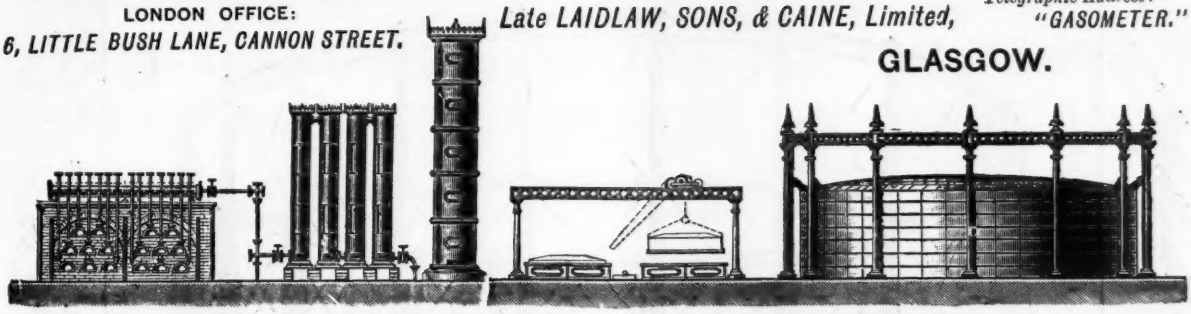
83, 85, & 87, FARRINGDON ROAD, LONDON, E.C.

THE BARROWFIELD IRON-WORKS, LIMITED,

LONDON OFFICE:
6, LITTLE BUSH LANE, CANNON STREET.

Late LAIDLAW, SONS, & CAINE, Limited,
GLASGOW.

Telegraphic Address:
"GASOMETER."



MANUFACTURERS OF ALL KINDS OF GAS PLANT.

RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES
CONDENSERS, EXHAUSTERS, AND ENGINES; SCRUBBERS, WASHERS;
PURIFIERS, WITH PLANED AND CEMENT JOINTS;
DRY AND HYDRAULIC CENTRE-VALVES;
HYDRAULIC AND HAND-POWER LIFTING APPARATUS;
GASHOLDERS, SINGLE-LIFT & TELESCOPE; CAST & WROUGHT IRON TANKS;
STATION METERS; GOVERNORS; SCREW AND RACK VALVES;
FOUR-WAY COCKS AND HYDRAULIC VALVES;
CAST-IRON GAS, WATER, & STEAM PIPES & CONNECTIONS; WROUGHT-IRON TUBES & FITTINGS;
IRON ROOFING, MARKET BUILDINGS, BRIDGES, GIRDERS, STEAM BOILERS;
PROMENADE PIERS AND LOADING WHARVES.

MANUFACTURERS OF OIL PLANT OF EVERY DESCRIPTION.

HENDERSON'S Patent Retorts, Condensers, Stills, Cast and Wrought Iron Tanks, Ammonia Stills, Wrought-Iron Gas-Mains, &c., &c

DESCRIPTIVE SPECIFICATIONS AND ESTIMATES ON APPLICATION.

W. H. ALLEN & CO.,

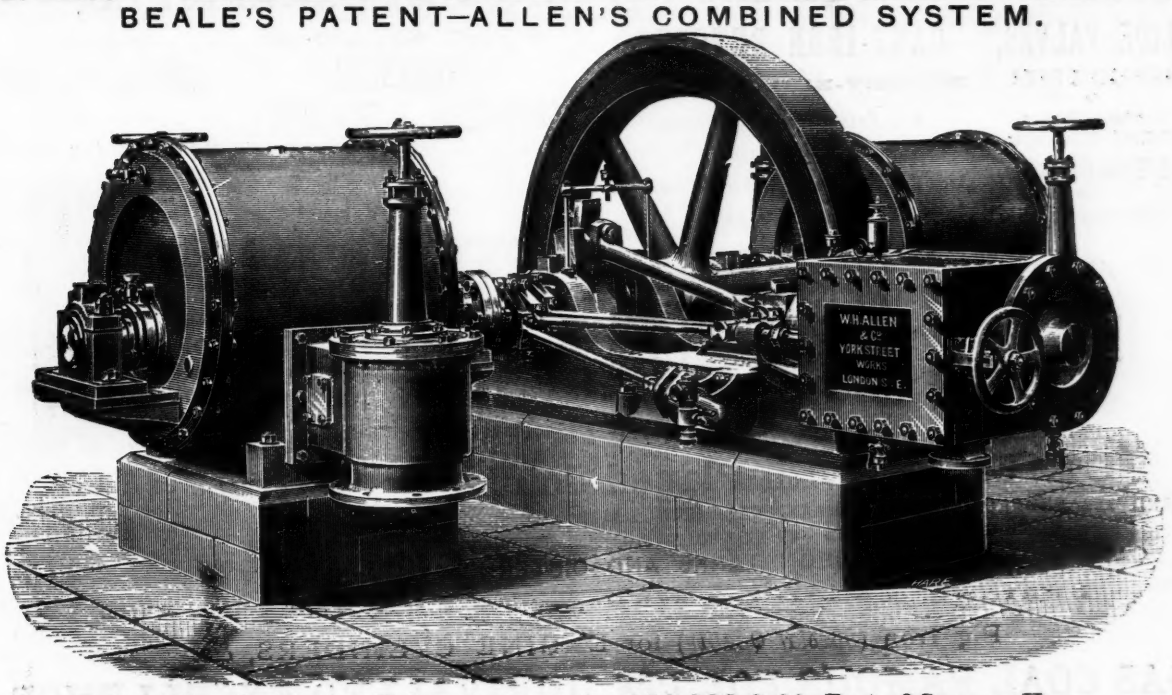
YORK STREET WORKS, LAMBETH, LONDON, S.E.,

And of QUEEN'S ENGINEERING WORKS, BEDFORD,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.

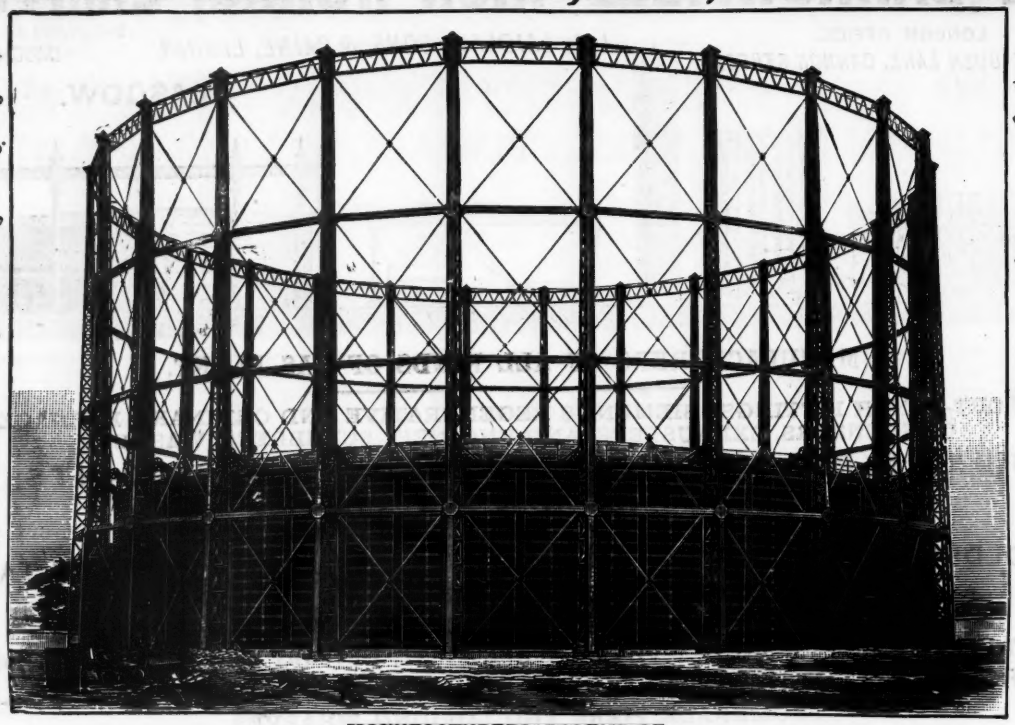


Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED PIPES, FOUL MAINS, RETORT-LIDS, WROT & CAST TANKS, PURIFIERS.

MANUFACTURERS SOLELY OF

HUMPHREYS & GLASGOW'S PATENT CARBURETTED WATER-GAS PLANT.

HAS ALREADY BEEN SUPPLIED TO GAS-WORKS AT

COPENHAGEN, BRUSSELS, GLASGOW, BELFAST, LIVERPOOL, TOTTENHAM, and is in course of Erection now at BELFAST (Second Contract), SWANSEA, & BRIGHTON.

Inquiries to be sent to the Patentees: 9, VICTORIA STREET, LONDON, S.W.

GAS COAL.

BEST

REAL OLD SILKSTONE GAS COAL,

Address THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

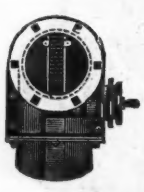
SLIDE VALVES,
WITH RACK & PINION
OR
Internal or External SCREWS of all sizes.

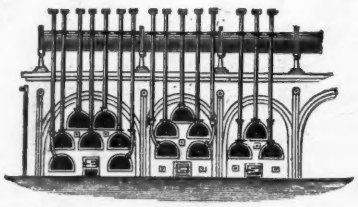
GASHOLDERS,
AND
Gasholder Tanks.

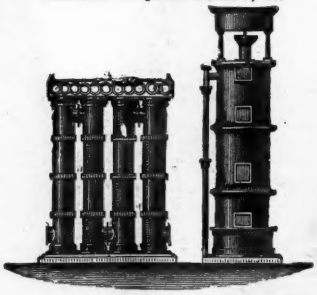
CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description,
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

WROUGHT AND CAST IRON
CONDENSERS, SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.

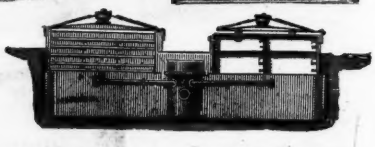
PATENT
CENTRE-VALVES
for working Purifiers,
Also Bye-Pass & Stop Valves.







PURIFIERS with Planed Joints,
HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS.
WOOD GRIDS.
CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

ANNOUNCEMENT.

BEAR CREEK CANNEL

We have opened a permanent LONDON OFFICE at

SUFFOLK HOUSE, LAURENCE POUNTNEY HILL, CANNON ST., E.C.

Mr. WM. J. WILSON will be our Representative. We thank our friends for past favours, and solicit a continuance through Mr. Wilson.

THE LOG MOUNTAIN COAL, COKE, & TIMBER COMPANY,
F. A. HULL, President.

PREVENT YOUR GASHOLDER CUPS FROM FREEZING

BY USING

CLAYTON'S

IMPROVED ANTI-FREEZING APPARATUS

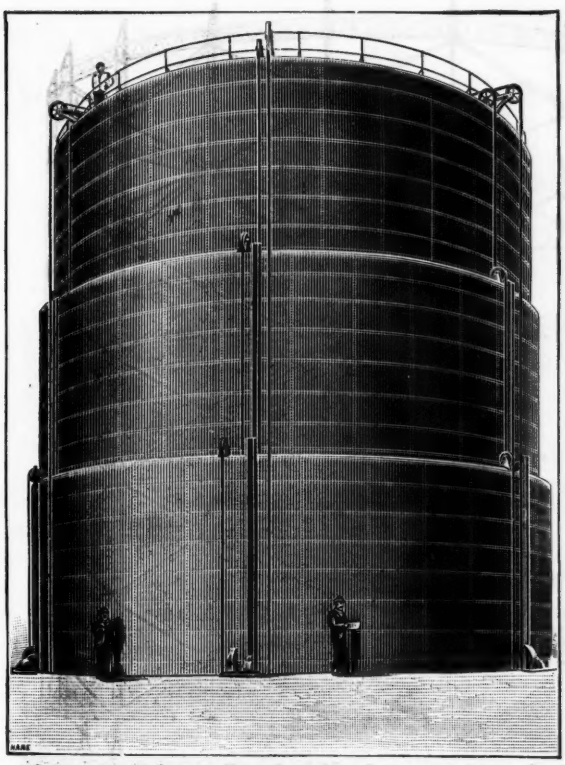
It is the CHEAPEST, SIMPLEST, and MOST EFFECTIVE in the Market.

CLAYTON, SON, & CO., Ltd., Gasholder and Boiler Works, HUNSLET, LEEDS

ASHMORE, BENSON, PEASE, & CO., LIMITED,

GAS-WORKS CONTRACTORS,

STOCKTON-ON-TEES.



From Photo. of Three-Lift Roped Holder, 50 feet diameter by 18 feet deep each Lift. Erected at Sligo, 1894.

Pease's Patent Roped Gasholders

THESE HOLDERS HAVE WORKED SUCCESSFULLY UNDER EVERY TEST TO WHICH THEY HAVE BEEN SUBJECTED SINCE 1889.

MAY BE SEEN AT MANY PLACES.

Send for Catalogue if requiring increased Storage.

The security afforded by this System is shown by the working of the Three-Lift Holder, the subject of this engraving; not only was the Holder unaffected by the recent heavy gales, but also the recorded strain on the Ropes was remarkably small.

London Office: 16, VICTORIA STREET, S.W.

Telegrams { "GASHOLDER, STOCKTON-ON-TEES." "APPARATUS, LONDON."

THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

Over 50 Maxim Patent Carburettors have now been fixed, capable of enriching

650,000,000

CUBIC FEET OF GAS PER DAY.

Among the Companies supplied are The Gaslight and Coke Company, the South Metropolitan Gas Company, Birmingham Corporation, Manchester Corporation, Rochdale Corporation, Bristol Gas Company, and many other Works, both large and small, where they have been working in some instances for the past **FOUR YEARS.**

More Gas and saleable Coke per ton of Coal Carbonized is produced; saving Capital Labour, Fuel, Wear and Tear, &c.

The Enrichment is **INSTANTANEOUS** and **PERMANENT.**

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

Dealers in Carburine and all other Naphthas for the Enrichment of Gas.

CUTLER'S PATENT GUIDE-FRAMING

SAFE. CHEAP.

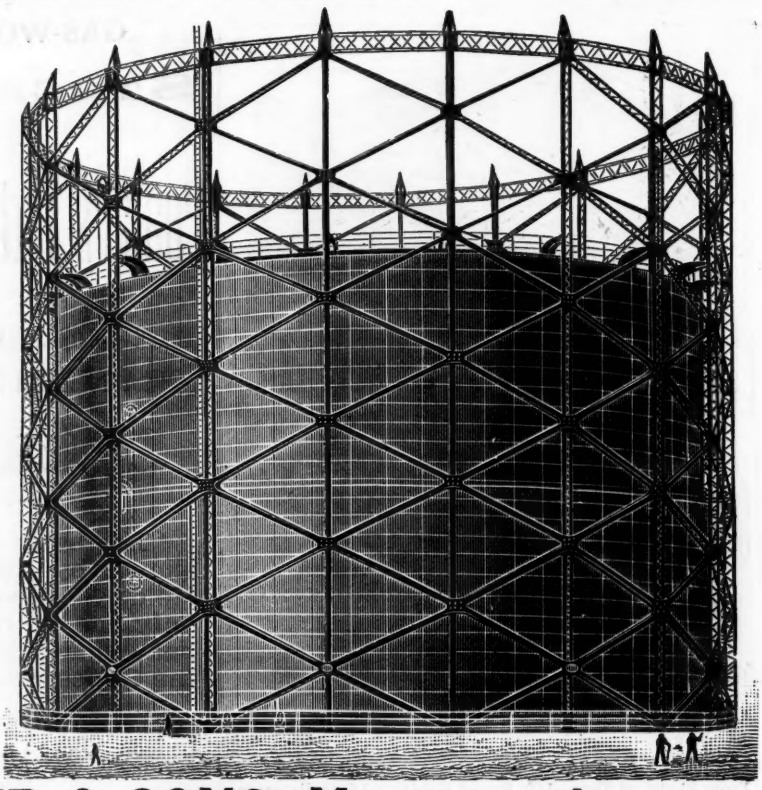
BEST POSSIBLE DISPOSITION OF MATERIALS.

SAVING IN COST OF TANK AS NO PIERS ARE REQUIRED.

EASY TO TRANSPORT and ERECT.

Adopted at the following Places:—

			Ft.	In.		Ft.	In.
TUNBRIDGE WELLS	2	Lifts	112	0	×	35	0
SHANKLIN	2	,,	60	0	×	20	0
HORNSEY	3	,,	110	6	×	35	0
SOUTHEND	2	,,	90	0	×	25	0
HULL	3	,,	81	6	×	30	0
ST. ALBANS	2	,,	68	0	×	22	0
ROCHDALE	4	,,	150	0	×	34	0
SUNDERLAND	3	,,	150	0	×	32	0
RYDE, I. of W.	2	,,	82	0	×	25	0
COPENHAGEN	3	,,	175	0	×	30	0



SAMUEL CUTLER & SONS, MILLWALL, LONDON.

Telegraphic: "Fortress, Donnington, Salop."

C. & W. WALKER,

Telegraphic: "Fortress, London."

MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

London Office: 10, FINSBURY SQUARE.

PURIFIERS with Planed Joints.

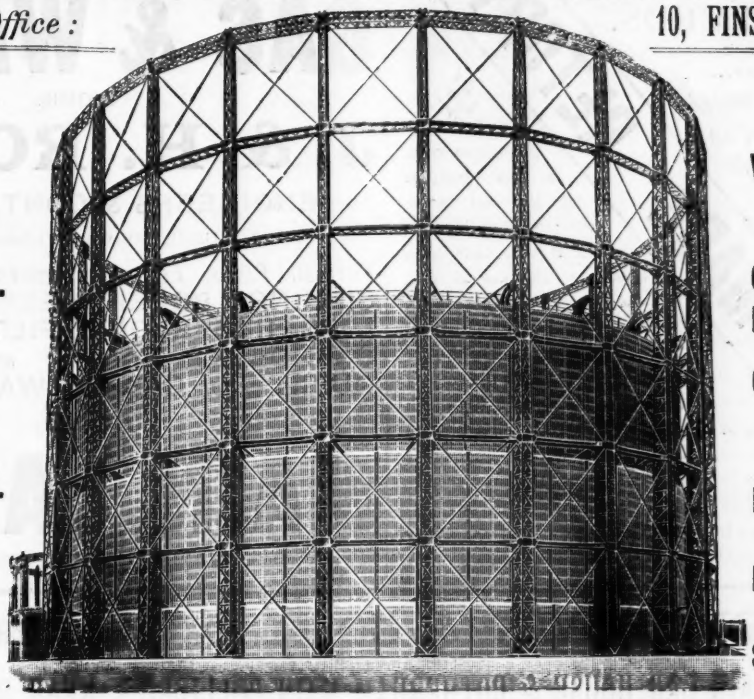
TOWER SCRUBBERS.

WECK'S PATENT CENTRE-VALVE.

CONDENSERS.

TAR PLANT.

SULPHATE OF AMMONIA PLANT.



Eight Million Cubic Feet Gasholder at Beckton, London.

WASHERS.

WASHER-SCRUBBERS.

CLAUS' SULPHUR-RECOVERY PLANT.

CENTRE & FOUR-WAY VALVES.

CRIPPS' HYDRAULIC MAIN VALVE.

RETORT-MOUTHPIECES.

SLIDE-VALVES, TAR-BURNERS, SIEVES.

WALKER'S PATENT PURIFYING-MACHINE.

TO GAS COMPANIES, CORPORATIONS, AND VESTRIES.

IMPROVED STREET LIGHTING

WITHOUT ADDITIONAL COST,

With THREE to FOUR TIMES the ORDINARY LIGHT,

CAN BE OBTAINED BY

THE INCANDESCENT GAS-LIGHT (Welsbach System)

The Inspector of Lighting in Glasgow reports that THE ANNUAL COST OF GAS FOR TEN INCANDESCENT GAS-LAMPS WAS £17, as against £39 with the old system, while obtaining FOUR TIMES THE AMOUNT OF LIGHT. The experiment lasted from May to November, during which time ONLY FOUR MANTLES WERE USED FOR TEN LAMPS.

Send for "Street Lighting" Pamphlet, which gives full particulars, to

THE INCANDESCENT GAS-LIGHT COMPANY LIMITED,

14, PALMER STREET, WESTMINSTER, LONDON.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

TELEGRAPHIC ADDRESS:
"ROBUSTNESS, LONDON."

GAS & WATER
WORK.
J. & H. ROBUS,
ENGINEERS & CONTRACTORS,
20, BUCKLERSBURY, LONDON, E.C.

Furnish Plans, Estimates, and Specifications for SINKING BOREHOLES *and* WELLS; *erecting* RESERVOIRS, FILTER-BEDS, *and* GASHOLDER TANKS; *and* EVERY REQUISITE *for* GAS *and* WATER WORKS,

INCLUDING

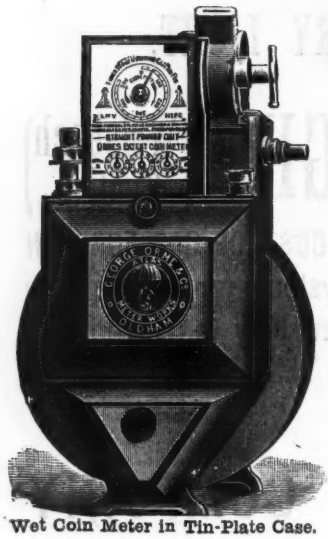
MAIN LAYING

EXCHANGE TELEPHONE 1756.

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

GEORGE ORME & CO.
ATLAS METER WORKS, OLDHAM.

ORME'S PATENT COIN PREPAYMENT METERS.
PENNY-IN-THE-SLOT.
We are Manufacturing, and are prepared to supply,


Wet Coin Meter in Tin-Plate Case.

WET & DRY GAS-METERS
As follows:—

Wet Meters in Cast-Iron and Tin-Plate Cases, and Dry Meters in Tin-Plate Cases, fitted with our

New and Improved Patent Attachment,

giving a definite quantity of Gas per Penny. This Attachment will be found **STRONG** and **SIMPLE**; and the Selling Price of Gas can readily be altered *in situ*.

A large number now in use.

Dry Coin Meter in Tin-Plate Case.

Any further Particulars, Prices, &c., will be given on application.

Telegraphic Address: "ORME, OLDHAM." A.B.C. Code (4th Edition) used. National Telephone: No. 93, Oldham.

WEST'S GAS IMPROVEMENT COMPANY, LTD.,

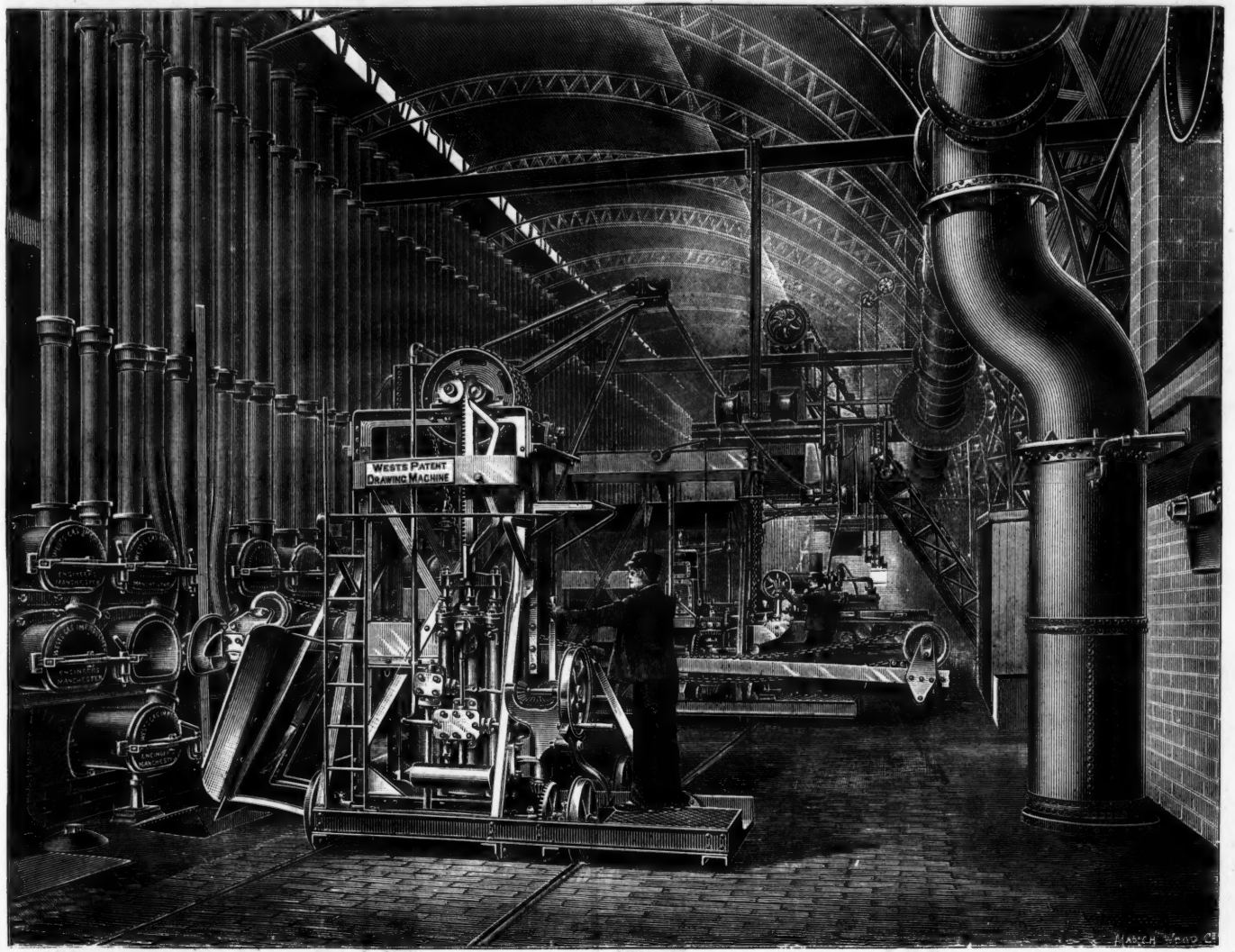
ALBION IRON-WORKS, MILES PLATTING, MANCHESTER.

AND

104, Queen Victoria St.,

LONDON, E.C.

WEST'S MANUAL AND POWER MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.



Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

AND

104, Queen Victoria St.,

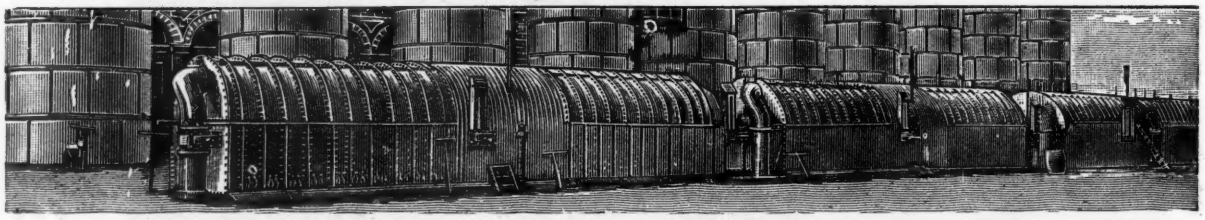
LONDON E.C.

OVER 560,000 LINEAL FEET OF RETORTS DAILY ARE CHARGED AND DRAWN BY WEST'S MACHINES.

KIRKHAM, HULETT, & CHANDLER, LD.

PATENT "STANDARD" WASHER-SCRUBBER

☛ **484** of these Machines (capab'e of dealing with **464,490,000** cubic feet of Gas daily) in use, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company have **30** of these Machines in use. They are also in operation at a great number of Gas and other Works in this Country and Abroad.

Sole Agents in Great Britain for Marshall's Patent Tar-Extractor.

Address: 3 & 4, Palace Chambers, Bridge St., Westminster, S.W.

JAMES & WILLIAM WOOD, Limited,

GAS COAL AND CANNEL CONTRACTORS AND EXPORTERS,

57, GRACECHURCH ST., LONDON, E.C.

Registered Office—28, ROYAL EXCHANGE SQUARE, GLASGOW.

R. LAIDLAW & SON

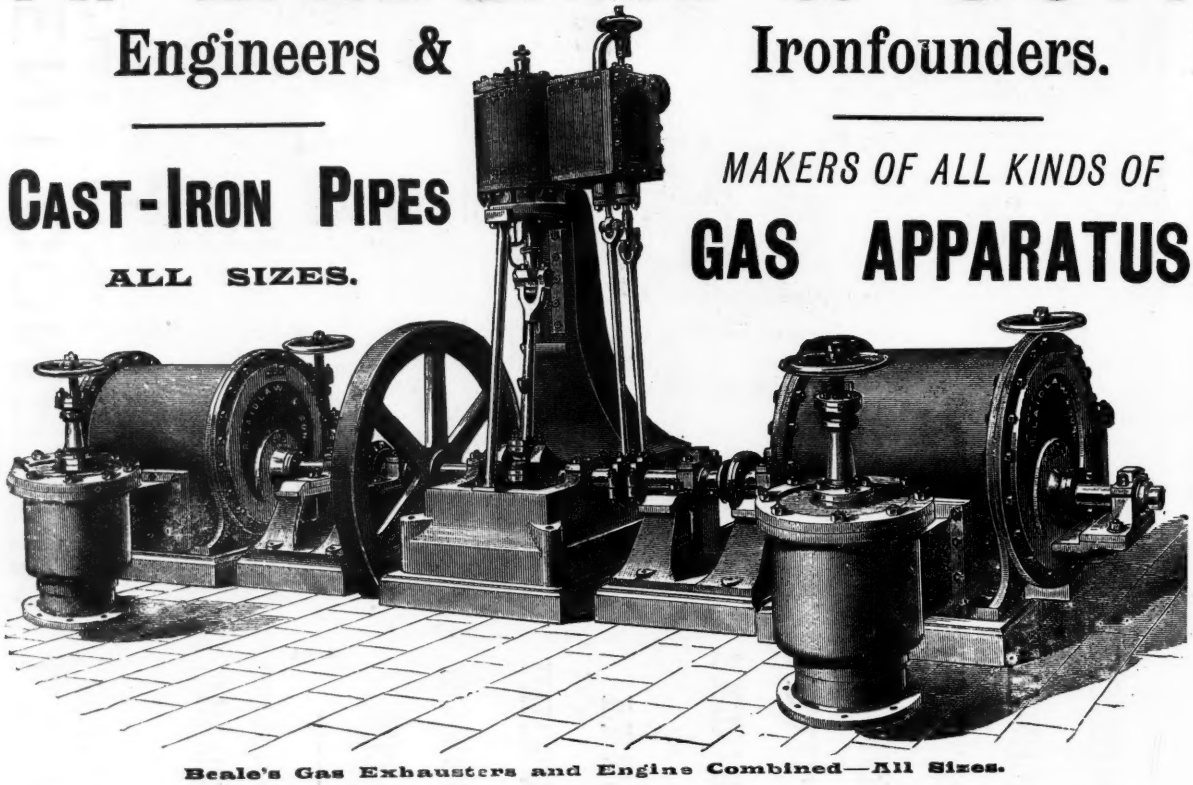
Engineers & Ironfounders.

CAST-IRON PIPES

ALL SIZES.

MAKERS OF ALL KINDS OF

GAS APPARATUS

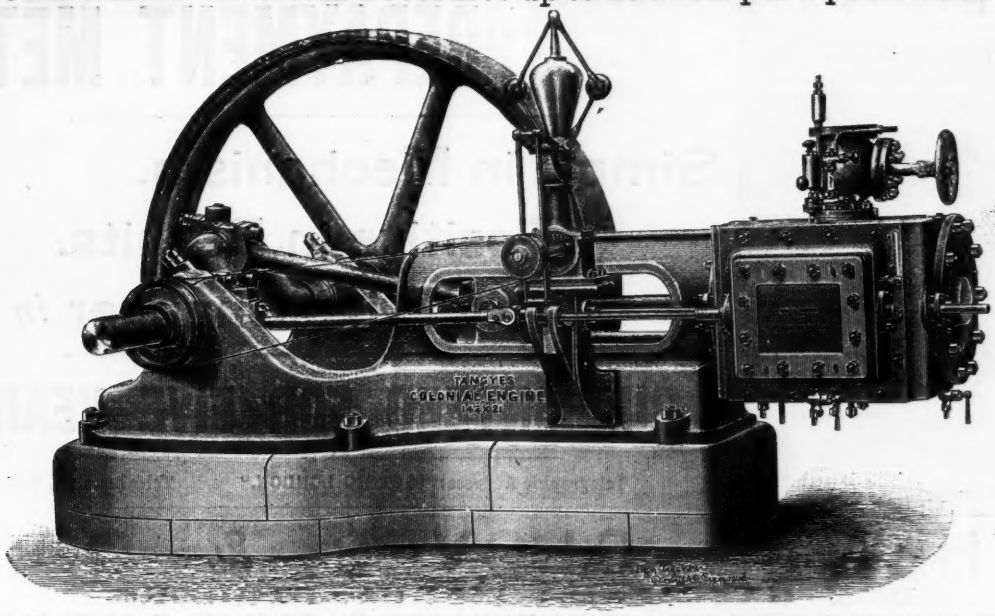


Beale's Gas Exhausters and Engine Combined—All Sizes.

ALLIANCE FOUNDRY, GLASGOW. | SIMON SQUARE WORKS, EDINBURGH. | 6, LITTLE BUSH LANE, LONDON, E.C.

TANGYES'
"COLONIAL" STEAM-ENGINE

Constructed for Steam Pressures up to 100 lbs. per square inch.



Tangyes' "Colonial" Steam-Engine, with the TANGYE-JOHNSON PATENT AUTOMATIC CUT-OFF GEAR. From a Photograph of the 14½ in. by 21 in. size.

PRICES QUOTED ON RECEIPT OF THE NECESSARY DATA.

TANGYES LIMITED, Cornwall Works, BIRMINGHAM.

AND LONDON, NEWCASTLE, MANCHESTER, GLASGOW, SYDNEY, JOHANNESBURG, BILBAO, ROTTERDAM, AND BELFAST.

Telegrams: "TANGYES BIRMINGHAM." *Copyright. Entered at Stationers' Hall. No. 69 E.*

THE CONTINUOUS

UNFAKEABLE.

GUARANTEED FOR FIVE YEARS.

UNBREAKABLE.

ADVANTAGES.

Every part is interchangeable.

Cannot be tampered with.

Cannot be broken by Hand or Coin Pressure.

ADVANTAGES.

Automatic Mechanism can be taken entirely to pieces, without interfering with Meter, in a few minutes.

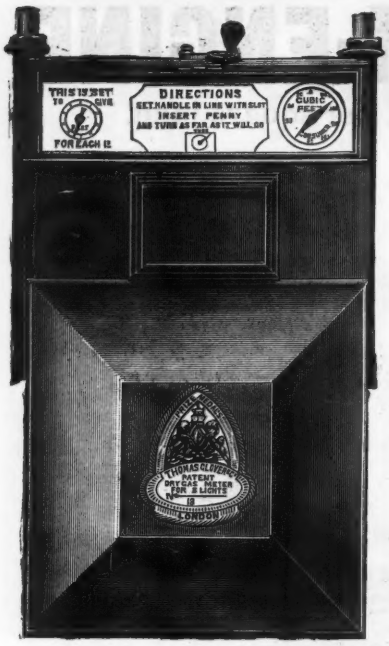
The Coins are absolutely in accord with the Registration of the Meter.

Full Information will be sent on application to:—

THE AUTOMATIC GAS-METER COMPANY, LTD.,

49, QUEEN VICTORIA ST., LONDON. | 1, UPPER BROOK ST., and 6, ROSAMOND ST. EAST, MANCHESTER. | 5, MERRION STREET, LEEDS.

THOMAS GLOVER & CO.'S



PATENT NEW IMPROVED PREPAYMENT METER

Simple in Mechanism.

Positive in Results.

Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

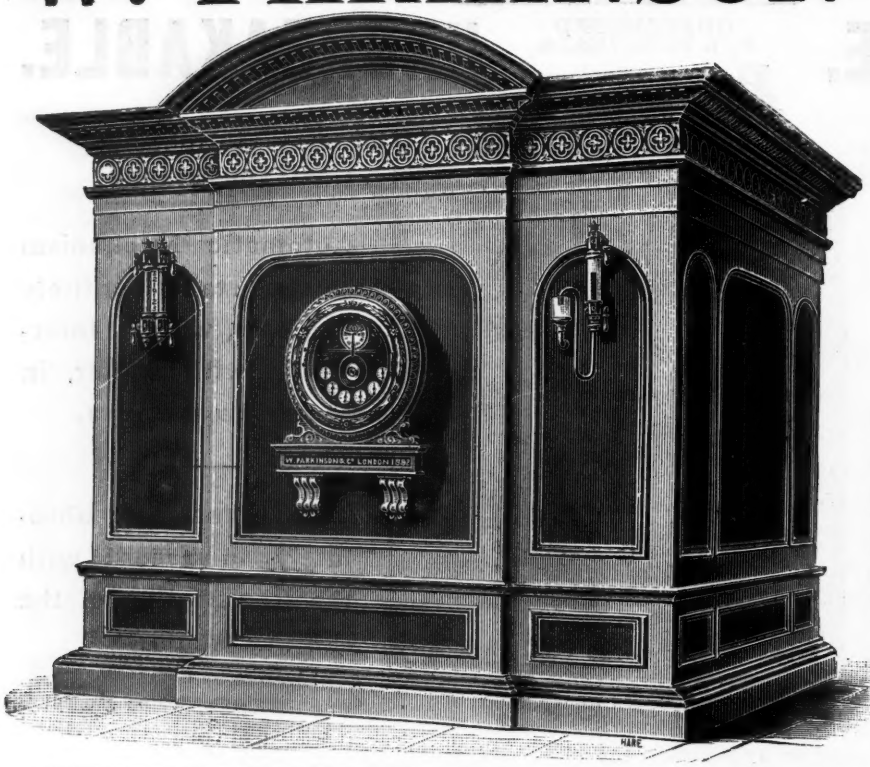
BRISTOL: 62, VICTORIA STREET. *Telegraphic Address: "GOTHIC."*

BIRMINGHAM: 3, BRIDGE ROW, DERITEND. *Telegraphic Address: "GOTHIC."*

LEEDS: BOAR LANE CHAMBERS, 4, BASINGHALL STREET. *Telegraphic Address: "GOTHIC."*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."*

W. PARKINSON & CO.



SQUARE STATION METERS.

All the Meters (which number 14) at the Beckton Station of THE GASLIGHT AND COKE COMPANY have been erected by the above Firm.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

CONTENTS.

EDITORIAL NOTES:—
GAS, LIGHTING, &c.— PAGE
The Chartered Report and Accounts . . . 257
The South Metropolitan Report and Accounts . . . 258
Conduit Explosion on Southwark Bridge . . . 258
The Glasgow Gas Poisonings . . . 259

ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market . . . 260
Electric Lighting Memoranda . . . 260
Mr. S. Carpenter on Gas Purification and Testing . . . 261
Water Bills for 1895 . . . 261

NOTES:—
A High-Speed Gas-Engine . . . 262
Wind Pressures at Bridstone . . . 262
Inutility of the Hot Test for Portland Cement . . . 263
A Combination Sewage-Destruction Scheme . . . 263

COMMUNICATED ARTICLES:—
The Behaviour of the Typhoid Bacillus and of the Bacillus Coli Communis in Potable Water. By Dr. Percy Frankland, F.R.S. . 263
Acetylene and the Gas Industry. By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S. . . . 266

TECHNICAL RECORD:—
The Detection of Inflammable Gas in Electric Culverts . . . 267
Mr. Crompton's Load Curve . . . 268

REGISTER OF PATENTS:—
Hydraulic Main Cleaner—Carpenter, S. . . . 268
Utilizing the Exhaust Heat from Gas, Oil, Tar, or Spirit Engines—Fidler, E. . . . 268
Regenerative Gas-Burner—Haeussler, J. . . . 268
Gas, Oil, or Vapour Burners for Heating Purposes, and Heating Stoves or Ranges employed therewith—Fennessy, F. R. . . . 269
Patent Notices . . . 269

CORRESPONDENCE:—
The Comparative Cost of Light from Different Sources . . . 269
The Manufacture of Carbide of Calcium . . . 270
Gas Lighting with Acetylene . . . 270
Mr. R. Forbes Carpenter on the Enrichment of Coal Gas . . . 270

PARLIAMENTARY INTELLIGENCE:—
Examiner's Room—House of Commons—The London Water-Works Transfer Bills . . . 271

MISCELLANEOUS:—
The Gaslight and Coke Company—Half-Yearly Report and Accounts 272
South Metropolitan Gas Company—The Half-Yearly Report and Accounts . . . 274
Metropolis Gas Supply—The Board of Trade and the Proposed Gas Inquiry . . . 274
Manchester Corporation Gas and Water Departments—The Reduction in Price; Proposed Abolition of Meter-Rents; The Collection of Gas and Water Accounts . . . 274
Meeting of the Pará Gas Company, Limited . . . 276
The Forthcoming International Exhibition in Amsterdam . . . 276
Electric Lighting Notes . . . 277
The York City Council and the Water-Works—Opposition to the Water Company's Bill; Proposed Purchase of the Undertaking 278
Notes from Scotland . . . 279
Current Sales of Gas Products . . . 279
Coal Trade Reports . . . 279
Gas and Water Companies' Stock and Share List . . . 280

PARAGRAPHS:—
Mr. Joseph Bradbury—The Welsbach Light in Belgium—Hydrogen-Chlorine Photometer—The Meteorology of Nottingham—The Heating and Ventilation of the Houses of Parliament—The New Constituent of the Atmosphere. . . . 259
Incandescent Gas Lighting in the Patent Office Library . . . 263
Colne Valley Water Company . . . 269
New Water-Works for Rugeley—Sales of Shares and Stock—The Forthcoming Exhibition in Bordeaux—Halifax Corporation Water Department—Fatal Accident to an Employee of the Manchester Corporation Water Department . . . 270
Cordova Water and Irrigation Works, Limited—Gas Supply of Rio de Janeiro—Explosion of Gas—Extended Adoption of West's Retort-House Machinery . . . 272
Calverley and Horsforth District Gas Company—Chester United Gas Company . . . 274
The Bridgend Dinas Brick Company, Limited . . . 276
The Suggested Acquisition of the London Water-Works by the County Council—The Newark Gas Company and the Corporation—The Little Don Water Schemes—The Proposed Purchase of the Bridlington Water-Works by the Local Authority—Lancaster Town Councillors on the Prepayment Meter System . . . 278
A Correction—Reductions in Price—The Bodmin Water-Works Company and the Camel Conservators—Unaccounted-for Gas at Teignmouth—The Compensation to the Officials and Servants of the Accrington Gas and Water Company—Water Affairs at Leeds 280

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

TO SUBSCRIBERS.

The JOURNAL is published every Tuesday, price 6d.; by post, 6½d.

TERMS OF SUBSCRIPTION.

One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in Advance.

If credit is taken, the charge is 25s. a year.

Telegraphic Address: "GASKING LONDON."

Telephone Number: 2789.

All communications, remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Post-Office Orders should be made payable at the Chief Office, St. Martin's-le-Grand; Cheques crossed "Union Bank of London."

EDITORIAL NOTES.

The Chartered Report and Accounts.

THE Directors' report and the statement of accounts relating to the past half-year's working of The Gaslight and Coke Company have been issued; the general meeting being called for Friday next. The report is somewhat brief; recounting first the fact of the profit balance for the half year, after providing for all fixed charges, being £594,049, out of which the statutory 12 per cent. dividend will be paid—leaving the substantial sum of £255,254 to be carried forward. "The improved financial position of "the Company" is given as the official reason for the abolition of meter-rents throughout the Company's district. The meteorological paragraph which has now become a regular feature of these reports informs us this time that during the last two months of the year the weather was very unfavourable for the sale of gas; so that while the consumption up to the end of October showed an increase, as compared with the corresponding period of 1893, of 4¾ per cent., the net result for the half year is an increase of 0·33 per cent. only. This is certainly small; but it is something for the undertaking to have got rid of the *minus* sign in this regard. We are then informed that the prices obtained for coke and tar products have been "again "exceptionally good," and that the increase of revenue from these sources has been considerably in excess of the amount of the reduction in the revenue from sulphate of ammonia, "the market for which," it is truly observed, "owing to the agricultural depression and other causes, "has been in a very unsatisfactory condition during the "past few months." As to this particular statement, it may be remarked that, while unfortunately the depression of agriculture is no new thing, the market for sulphate was extremely favourable for producers up to a certain time, and then it went to pieces. Why this came to pass may be matter for some differences of opinion; but it was said "in the street" at the time to have been largely due to the mistake of somebody, who had the selling of a heavy supply of the commodity, in overstaying the market, with the object of getting half-a-crown a ton more than anybody else. This clever idea failing to be realized, and the market showing signs of weakness in face of the large stock that was being held over, the story further goes to the effect that the holder suddenly became frightened, and threw the stuff in at any figure that could be obtained for it. Of course, this explanation may be included among the "other causes" that are referred to in the Directors' report, or they may never have heard of it. Not every tale of the market-place, it may be supposed, penetrates to the serene heights where Chartered Directors sit aloof from the cares that vex the common run of traders in manure stuffs.

Turning to the accounts, it appears that the Company have spent a good deal of money upon capital account during the half year; the net increase under this head, after deducting credit allowances for depreciation of plant and sale of surplus lands, being £81,534. The addition for the previous half year was £57,613, making £139,147 for the year. Seeing that it is not exactly a rapid rise in the demand for gas that the Board have to provide for, it is to be hoped that the money is being laid out upon remunerative objects, to eventually show its influence in the saving of labour and other ways of reducing the cost of manufacture. The Company cannot afford to increase the capital burden, which already presses so heavily upon the undertaking, for any other objects. The revenue account shows that gas, priced at 3s., 2s. 10d., and 2s. 4d. per 1000 cubic feet, brought in £1,290,073, as compared with £1,362,226 for the corresponding period of 1893. For the public lighting there is a small but not insignificant advance, which is a good thing for more reasons than one. Residuals show an increase of from £372,881 to £396,989, or of £24,108, notwithstanding a loss of £5378 on sulphate. In connection with what we had to say on the 15th ult. about the rumoured forestalling of coke, it is worthy of remark that, while the Chartered Directors congratulate themselves on having obtained "exceptionally good" prices for their coke (which is manifested by their having realized an increased revenue of £8723 for this residual, whereas the quantity sold was 711 tons less), they are left with a stock of 47,797 tons as compared with 19,398 tons last winter. Hence it appears that, if the trade had been as good

as the price, the finances of the Company would have been materially bettered. Tar and tar products improved from £62,221 to £81,188. On the other side of the account, gas manufacture is shown to have cost £920,041, as against £941,482; the decrease being divided between coals and repairs. Coals cost £12,547 less; and the substantial cut of £13,331 has been made in repairs. On the other hand, salaries, carbonizing wages, and purification have been higher. Distribution cost £4018 more, and rates and taxes are up another £4734. Parliamentary charges are non-existent for the time being; and law charges have dropped from £8254 to £1145. All the other items of expenditure are a trifle lighter.

As to the coal account, whereas for the previous half year, when the returns were first given in the present form, it needed 923,469 tons of common coal, 7934 tons of cannel, and the equivalent in oil and petroleum spirit of another 37,611 tons of cannel, to make 9,872,285,000 cubic feet of gas, now we have 902,130 tons of common coal, 4810 tons of cannel, and the equivalent of 27,542 tons of cannel in oil and spirit, carbonized to produce 9,582,506,000 cubic feet of gas. The make of gas per ton has risen from 10,188 to 10,254 cubic feet; while the proportion of cannel and other enrichers has dropped from 4·7 to 3·4. This is a very good showing for the carbonizing staff. There is a slight increase in the quantity of unaccounted-for gas as compared with that for the corresponding half of the previous year, but a diminution in comparison with the previous six months. As there is no mention of the subject either in the report or accounts, the proprietors will expect the Governor—Colonel Makins—to say something on Friday about the prepayment system.

The South Metropolitan Report and Accounts.

In another column will be found the South Metropolitan report and accounts for the past half year, which reveal many interesting matters. First and foremost, the report announces with excusable pride an augmentation of 7·33 per cent. in gas consumption as compared with the corresponding six months of 1893—a truly remarkable growth of business. The cause of the large increase is partly explained in the second paragraph of the report, which states that during the half year 11,147 new consumers were placed upon the Company's books, of whom 9103 were on the automatic prepayment system. The Company have now 25,516 consumers of this class, of whom 12,033 have gas cooking-stoves in use. The favourable estimate already formed by the Company of the consuming capacity of these customers is again confirmed. Those without stoves burn, on an average, over 11,000 cubic feet of gas per annum, which is increased to 19,000 feet where there is a stove. Moreover, of the total number of automatic prepayment meters fixed by the Company since they started with them in 1892, only 729 have been disconnected, and nearly all of these have since been again connected. This is indeed a tale worth telling; and when it is remembered that, as the report states, the whole of this popular branch of the Company's business has been created and built up since 1892, one cannot fail to be impressed by a sense of the strong vitality that must belong to an industrial organization capable of putting forth such an offshoot in so short a period. Mr. Livesey, after his manner, cannot let this wonderful story go without tacking on to it a "moral" designed to exalt company gas administration in contrast with the methods of municipal management. All this good work in the popularizing of gas, he urges, is due to company initiative. The municipalities did not confer this boon upon the working-class population, for all the tall talk of all the "Progressives" in the land. It is true; but lack of initiative is inherent in municipal administrative and trading departments, for obvious reasons, and is one element in the price that has to be paid for whatever advantages may attach to municipalization. In this connection, the Directors take the opportunity of saying a good word for the conduct of the Company's staff and workmen.

The pending Bill of the Company in Parliament is mentioned in a paragraph of the report, which states that the chief purpose of this measure—the conversion of the Company's 10 per cent. stock into double the nominal amount, bearing a 5 per cent. dividend—is an operation which has been rendered necessary by the law that requires all new capital issues to be sold by auction, with the result that capital bearing a nominal dividend of 13 per cent. earns less than 4½ per cent. at present prices. "This anomaly "and injustice," it is stated in the report, "the Bill seeks "to remedy."

Lastly, the report states that the profit earned in the half year enables the Directors to recommend the payment of the usual 13 per cent. dividend. Beyond this, the price of gas allows another ½ per cent. of dividend to be disposed of; but this the Directors advise should be added to the reserve fund. The insurance fund has been increased by £5350, and the rest of the money goes to the undivided balance, which now reaches £28,286. The total reserves will thus amount to £131,714—a very creditable showing for a Gas Company who were supposed to be beaten to their knees in 1889, and have suffered a good deal since then through the vagaries of coal, and who are actually selling gas within a penny of the lowest price ever recorded in the history of the undertaking.

There is little to be said about the accounts, save that they exhibit a tendency to be more explicit than formerly as regards the sources of revenue and expenditure. Coals have cost rather more than in the two preceding half years; and coke and ammonia were weak. Tar, on the other hand, has done rather better. A striking feature of these accounts is the large and increasing totals representing the financial results of the profit-sharing scheme. The scheme itself figures for an expenditure for the half year of £6000; and in the balance-sheet the sum of £31,732 stands against the suggestive line: "Workmen's bonus "and savings deposited with Company." Various remarks might be made respecting different ideas suggested by this entry; but we will content ourselves with offering only two. The first is that the figures explain why the appointment of workmen-shareholder Directors was contemplated in the parliamentary notices of the Company's new Bill; the second, that, judged by the standard of accumulated funds, this single profit-sharing scheme has more behind it than all the New Trade Unions of the country put together. Why, if Mr. John Burns or Mr. Ben Tillett had upwards of £30,000 to play with, they would neither be "to haud "nor to bind." The world is apt to forget that it is lack of the sinews of war which keeps these gentry so quiet; and here is a kind of union—the union of employers with employed—which has lots of money, and is making more at a great rate. And there is no fear of the treasury being discovered to contain less than it is credited with. This is a matter which the British workman is likely to take note of. It is commonly understood that Mr. W. Thorne has not relinquished all hopes of seeing the Gas Workers' Union once more established in the South Metropolitan Gas-Works; but does he really think this would be a good exchange for £31,732?

Conduit Explosion on Southwark Bridge.

There was another alarming street conduit explosion in London on Friday afternoon, this time in the South Metropolitan district; the locality being the west side of the Surrey end of Southwark Bridge. The explosion, as so generally happens in these cases, was of a cumulative type; the last and greatest detonation being preluded by a sort of touch-hole explosion, which on this occasion is reported to have originated in a surface water gully. This was followed by the upheaval of the paving-stones to a height of about 4 feet, accompanied by a dense volume of smoke. "Immediately afterwards," to quote from the *Daily Chronicle* report, "explosions occurred at four of the "chamber boxes, or manholes, connected with the City of "London Electric Light Company's mains, the covers of "which were hurled into the roadway, and the surface "of the pathway was thrown up." Happily, though three persons were knocked down and struck by the flying stones, no very great harm was done. Everybody in the vicinity, however, had a great fright. The *Daily Graphic*, which came out next day with a spirited sketch of the affair, states that five persons were more or less hurt, while others complained to the police of trifling injuries. Naturally, the explosion, coming so soon upon the others in the north of London and in the City, has created some consternation in the public mind. To a *Daily Chronicle* reporter who interviewed him after the event, Mr. Buck, the Engineer of the City of London Electric Lighting Company, made the communication that "where the explosion "first occurred, there was a gas-meter for registering the "supply of gas to the bridge lights, which on his arrival "was leaking very much. His opinion was that a lighted

"match had been thrown down the gully and ignited the "gas; and that, owing to the escape of gas induced by "the action of the frost on the pipes, the explosion had "spread to the electric light mains." May we venture to suggest that engineers of electric light companies would, in such circumstances as these, show a wise discretion by refraining from making *ex parte* statements designed to prejudice the public against other people? The electric lighting interest will gain nothing in the long run by such tactics, besides creating in the minds of those whose duty it is to ascertain the truth of these matters, and ultimately in public opinion, an impression that if its zealous apologists had no fears for their own position, they would not be so desperately eager to shuffle off upon the gas supply the blame for causing these catastrophes. It is quite possible that Mr. Buck's story about his finding a leaking gas-meter on the bridge may be true. But we should say that, upon the face of it, this bit of evidence, so far from indicating that gas was the cause of the explosion, goes to prove the exact contrary. Mr. Buck does not say he found the gas burning—nobody says so. The inference, therefore, is that it was the effect of the explosion that caused the gas-meter to leak. Nobody ever heard of a coal gas explosion due to an accumulation of gas from a continuing leak that did not leave the escaping gas alight; always supposing, of course, that there was nothing to extinguish a flame between the locality of the explosion and the place from which the gas came. We are not inclined, however, to discuss the subject of the cause of the Southwark Bridge explosion until after the facts have been established by Major Cardew's inquiry; and we trust our good friends the electricians will be equally respectful of the cause of truth, which will certainly not be served by the interested and random assertions of partisans. We observe, by the way, that the *Daily Graphic* declares it to be "notorious that, owing to the low pressure habitually "maintained in gas-pipes, it is not usually thought neces-"sary to make them as proof against leakage as they "ought to be." And the remark is made upon this that in these days, when the streets are getting so undermined by subterranean passage of all sorts, "the best workmanship "in these matters is essential to the public safety." The reflection would be perfectly just if the fact had been as set out; but how such a "notorious" delusion got into the mind of this newspaper critic of modern practice in gas distribution it would be interesting to learn. It is probably another variant of the popular superstition with regard to unaccounted-for gas.

The Glasgow Gas Poisonings.

THE cases of poisoning by the city gas supply of Glasgow are becoming very serious indeed. There was another on Friday, happily not resulting in loss of life, though seven persons were more or less seriously affected; and the consequences might have been graver but for the circumstance of the previous occurrences of the same type having warned the authorities of the proper course to be followed upon the discovery of the mischief. According to a local newspaper report, the scene of Friday's trouble resembles "those in which the other occurrences took place, in so "far as the tenement is an old one, and inhabited by a "poor class of tenants, and in the same singular fact that "there is no gas used in the house." The apartments occupied by the sufferers are situated on the ground floor; and when, after some delay, the police were at length communicated with, they found the place smelling strongly of gas. With a quite remarkable exercise of common sense, the police refrained from searching for the gas with a naked light, but opened all the windows, and communicated with the gas officials. When the workmen of the Corporation Gas Department arrived, they found that the gas "came from a main-pipe "at the mouth of the close." So far the newspaper reporter. Our Scotch Correspondent has kept the record of these disturbing occurrences; but we have hitherto refrained from noticing them here, hoping that they were sporadic, and capable of being accounted for by reference to some coincidences of purely local interest. But the matter has now apparently gone beyond this; and while it would not be to the public advantage to unduly press the Gas Department for explanations, the members of the Gas Committee and their advisers must feel that it is high time something was said and done to reassure the public mind, which cannot but be gravely affected by manifestations of the existence in the city of a danger at once mysterious in its origin and erratic in its appearances. We have good grounds for believing that a considerable amount of apprehension exists on the subject among the population of Glasgow; and unless reasonable assurances are speedily forthcoming with regard to the causes of these repeated casualties and the means which the authorities propose to employ to prevent their recurrence, the people will get into such a condition of panic-fear as may render difficult the restoration of confidence in the public sanitary authority.

Mr. Joseph Bradbury, who has been Secretary and Manager of the Bakewell Gas Company for several years past, died rather suddenly yesterday week. Mr. Bradbury also held the position of Secretary to the Bakewell Savings' Bank Company; and although he had attained a great age, he was still active, and followed up his employment to the last.

The Welsbach Light in Belgium.—M. Busine recently informed the Belgian Gas Association that 45,000 incandescent gas burners are in use in that country. He asserts that the diminution of 40 per cent. in the consumption of gas caused by these burners is partly compensated by the increased number consumers are induced to use, owing to the cheapness of the light.

Hydrogen-Chlorine Photometer.—An apparatus has recently been designed by Herr Josef Kremer, of Gladbach, for estimating the chemically-active rays of a given source of light. The so-called photometer consists of a glass vessel containing hydrochloric acid, enclosed in an opaque case. Two electrodes pass into the acid, and a tube is connected to the glass vessel. On the passage of an electric current, the gaseous products of decomposition of the acid force some of the liquid into the tube. On breaking current, and opening a door in the case so that the light penetrates to the gaseous mixture in the vessel, the rate of diminution in volume of the latter is ascertained by means of a scale attached to the tube, and forms a measure of the chemical activity of the rays of light.

The Meteorology of Nottingham.—We have received a copy of the valuable chart prepared by the Borough Engineer and the Medical Officer of Health of Nottingham (Mr. A. Brown, M.Inst.C.E., and Mr. Philip Boobbyer, M.B.) to illustrate the relations of the number of deaths from various causes to the principal meteorological conditions of the borough on each day of the past year. It is accompanied by a table containing the results of meteorological observations carried on during the year, as furnished weekly and monthly to the Registrar-General, as well as others giving the rainfall registers and earth temperatures. The chart presents graphically a mass of information which could scarcely be so well conveyed in any other form; and the work as a whole possesses more than local interest.

The Heating and Ventilation of the Houses of Parliament.—In the JOURNAL for May 8 last year, we noticed, in an article on "The Sanitary Equality of Gas and Electric Lighting," a report made by Mr. J. Keith, Assoc.M.Inst.C.E., on the working of the warming and ventilating apparatus at the Houses of Parliament. Mr. Keith has lately made a further report, addressed to Sir Isaac Holden, Bart., M.P., in the course of which he demonstrates that sewer gas still pervades parts of the buildings, and that the ventilating arrangements are susceptible of much improvement. He suggests that the only effectual remedy for the present state of matters is, first of all, to have entirely separate upright shafts for the ventilation of the drainage; and, secondly, to use silent powerful exhaust-fans at the base of each of the aspirating shafts, instead of coke fires on open grids, for the ventilation of the buildings.

The New Constituent of the Atmosphere.—Last Thursday was an eventful day in the history of the Royal Society, as well as in scientific circles, inasmuch as it was the first occasion on which a meeting of the Society had been devoted to the discussion of a single subject in the presence of the general public. Moreover, the subject was one to which a good deal of attention has been directed since the meeting of the British Association in Oxford last year, when Lord Rayleigh startled the world by announcing the discovery of a new constituent of the atmosphere. It was to hear his Lordship's colleague—Professor Ramsay—read a paper on this subject, communicated to the Society by them conjointly, that a large audience assembled in the theatre of the University of London on the 31st ult. The new gas is called "argon;" and, so far as is at present known, it stands entirely unrelated to any other substance in Nature. We are therefore warned that "every theory of its constitution must be accepted with extreme caution." As to its physical properties, its solubility in water is 2½ times as great as that of nitrogen. Examined by the spectroscope, it shows that it has two distinct spectra, like nitrogen itself; but while the nitrogen spectra are of different characters, those of "argon" are of the same type. According to Professor Olszewski, of Cracow, the critical point of the new gas is −121°; the critical pressure, 50·6 atmospheres; the boiling-point, −187°; the melting-point, −189·6°; and the density of the liquid, 1·5. The new nitrogen has been aptly characterized as a "strange substance, being as volatile as nitrogen or oxygen, and therefore not capable of separation by difference of boiling-point."

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 280.)

THE general tendency on the Stock Exchange during the past week has been dull, and inclined to flatness. Apart from the heavy settlement, which checked fresh business, the state of things in America had a strong effect on the course of prices. It is expected that the upshot of the crisis will be beneficial to the country; and the American market rose. But in view of the probable demand for gold, a good deal of profit-snapping in gilt-edged securities ensued; and Consols, which not long ago touched 105¾, fell to 103⅜. Other markets also were dull; bad weather and light traffics depressing home rails. Business in the Gas Market was fairly active, though not quite up to the measure of the preceding week. The advances in quotation are numerous and extraordinarily large; the demand for approved securities being far in excess of the supply. In Gas-lights, the "A" opened at 265, and pushed steadily on at improving prices till 270½ was marked at the close. Very little was done in the secured issues; but anything offered was readily taken at the top price quoted. The report and accounts for the half year, though not showing much increase in the business, were regarded as generally satisfactory, and justifying the position of the ordinary stock as a 4½ per cent. security. South Metropolitans have had an eventful week, advancing by leaps and bounds to prices which not long ago would have been regarded as practically impossible. Imagination can scarcely realize that these figures could be improved upon if the scheme for converting the capital into 5 per cent. stock goes through. Nothing was done in Commercials, except one bargain in debenture stock. The Suburban and Provincial Companies were also extremely quiet; and quotations did not move. The Continental Companies fully shared in the general buoyancy, especially Imperial, which rose from 235 on Monday to 242 at the close. Malta also made a further advance. Of the rest, the only one to make a move was Sydney debenture. The Water Companies quieted down considerably from the previous week's activity, but remained very firm and strong.

The daily operations were: Business in Gas on the opening day was devoid of any particular feature, except general firmness, though quotations did not move. On Tuesday, transactions were very limited, except in Gaslight "A" and Imperial Continental. The former advanced 1; and the latter, 2. On Wednesday also business was considerably restricted; but the enhancement of prices proceeded briskly. South Metropolitan "C" rose 7½; ditto "B," 3; Imperial Continental, 1; and Malta, ¼. In Water, West Middlesex gained 2. Everything was steady and unchanged on Thursday, except that *ex div.* quotations put European (partly paid) ½ better, and gave New River debenture a rise of 2. Business in Gas on Friday was confined to Imperial Continental and Gaslight "A." In the latter stock, and in the "J," there was an advance of 2. Saturday was brisk and lively; and prices rose freely. Gaslight "A" improved 2; Imperial Continental, 3; South Metropolitan "A," 2½; ditto "B," 2; ditto "C," 5; and Sydney bonds, 1.

ELECTRIC LIGHTING MEMORANDA.

Electrical "Booms" in Newspapers—Dr. Fleming's Lectures—A Satisfactory Prize Competition—Mr. Lane on Mr. Crompton's Load Curve.

THERE has not been much electric lighting news in the daily papers of late; circumstances which it would be superfluous to describe having operated to preserve the innocent and gushing reporter from the temptation that so frequently beset him a few years ago to make sensational "copy" out of the utterances of glib electrical schemers. But within the past week or two there have appeared in several otherwise well-conducted newspapers reports concerning two electrical projects, couched in such terms as indicate that the common or "garden" reporter is as gullible as ever when an asserted electric lighting novelty is brought under his uncritical notice. When one picks up a respectable newspaper, and one's eye is caught by the heading "Important Electrical Discovery," which introduces an article starting with the declaration that "a discovery of great importance connected with the production and utilization of electricity has recently been effected in Birmingham, and is exciting much interest and discussion amongst electricians and other scientists," it is disappointing to find that the article is all about a new patent voltaic battery, producing electricity by the consumption of zinc. We echo in this regard the impatient exclamation of the *Electrical Review*, that "few things are more annoying to the technical man, than to observe the freaks of the newspaper press in booming inventions or so-called discoveries in such language as leads the non-technical reader to believe that some great revolution is taking place in electrical science. When the opinions of qualified experts are consulted, it generally happens that the 'ingenious young men' who are so highly praised have not in the least degree exceeded the achievements of their predecessors." Our contemporary concludes a scathing exposure of the quality of the great Birmingham "discovery" in question with the remark: "Probably, some day, 'Nature will finally allow the veil to be lifted which still shrouds one of her greatest secrets;' but it seems hopeless ever to expect that the veil of technical ignorance will be lifted from the minds of newspaper representatives, notwithstanding the advantages now offered, even to editors, of attending elementary science classes." The other absurd report dealt with the surprising novelty (!) of a scheme for combining public refuse destructors with electric lighting, under the taking head-line: "Gold in the Dust-Heaps." It seems too much to expect that editors of newspapers who are so profitably and absorbingly engaged in regulating the affairs of the universe, advising Cabinets, and telling Kings and Presidents their duty in all emergencies, should find time to look after the doings of their impressionable "interviewers;" but really they might make a standing order to the effect that these ubiquitous gentlemen should confine their attentions to those schemers, electrical and otherwise, who have actually done something and can prove it, to the exclusion of those who are merely "about to begin." When we have facts to go upon, we can readily sift them; but it is a thankless task to follow all the vapourings of the gentry who are, by their own showing, always going to set the Thames on fire, yet never get so far as striking a light.

The series of lectures on the work of an electrical current which Dr. J. A. Fleming has recently concluded at the Royal Institution, while nominally addressed to a juvenile auditory, have been justly esteemed by a far wider circle for the valuable information they contain upon all sorts of matters of interest to students of modern electrical developments. It is a capital way to get at what is really known in any branch of science, to set a competent authority to talk to children about it. He is obliged then to get off the "high horse" upon which the average professor thinks it due to his dignity to ride in the presence of common people, and also to do without the awe-inspiring mathematical arm which he loves to flourish before the dazzled eyes of his fellows. He gets down to the bottom facts, or what he believes to be such; and if he is a truly able man, which is Dr. Fleming's case, he enjoys the unwonted freedom of speaking of the things of Nature in a natural style. It is no easy matter to do this. Indeed, only the greatest masters in science can properly treat their subject in an elementary way. The vapid smatterers who, because they know very little about anything in the whole wide world, think themselves qualified to expound a particular science in an "elementary" fashion, only succeed in giving proof of their own emptiness. What most people interested commercially or industrially in electric currents will seek in Dr. Fleming's lectures, is light on the actual conditions and prospects of electrical science, as compared with its state when he last lectured upon the same subject. There is not much to say on this head; but the lectures make good reading all the same.

We had something to say a short time ago about the fatuity of offering small money prizes to inventors of commercially valuable articles; and we pronounced in favour of the employment of this means of encouragement as an incentive to research work of the non-remunerative kind. An example of the successful employment of this method for the particular purpose indicated is supplied by the history of the Elihu Thomson prize competition, recently adjudicated upon in Paris. Professor Thomson some years ago received a prize of 5000 frs. from the City of Paris for his electricity meter, the production of which, it is hardly necessary to remark, was not due to the offer of the prize in question. He therefore organized a competition upon terms which were published in 1892; leaving his prize-money for the reward. Instead of offering prizes for practicable inventions, however, Professor Thomson left it to a committee of scientific men to propound subjects for treatment in a way to throw fresh light upon obscure or doubtful points. The Committee duly formulated four subjects for discussion in competitive essays; and the same number of compositions were forthcoming—not a heavy crop, by any means, but enough to redeem the competition from the reproach of failure. The quality, however, of two of the essays appears to have been remarkably good; so that before the envelopes containing the authors' names were opened, a second prize of equal value was made up by Professor Thomson and others. The prize-winners were Dr. A. Webster, of Clark University, Worcester, Massachusetts, and Professor Oliver Lodge and Mr. R. T. Glazebrook. Thus was Anglo-Saxon science justified of her sons.

Mr. Denny Lane has written to the *Electrician* with reference to that portion of Mr. Crompton's address to the Institution of Electrical Engineers, in which he gave a diagram of, and discussed the load factor of the Metropolitan Electric Lighting Companies.* Mr. Lane draws attention to the circumstances in which this diagram was prepared; showing that, unless certain considerations are borne in mind, it may be misleading. He observes, first, that as the bulk of the supply goes to the west end of the town, where places of public and private entertainment keep very late hours, the load factor is more favourable than it would be even in other parts of the Metropolis. Secondly, it is remarked that Londoners generally keep later hours than the inhabitants of provincial towns; and, thirdly, the day selected, being the shortest in the year, shows a load factor the most favourable out of the whole 365 days. Mr. Lane accordingly asks Mr. Crompton to favour the world with

* The diagram, with Mr. Lane's letter referring to it, is given elsewhere.—ED. J.G.L.

similar diagrams for March 22, June 22, and September 22; offering, in return, if they are deemed of sufficient interest, to furnish similar diagrams in respect of the gas consumption in Cork. There should be no difficulty in getting this interesting set of diagrams.

MR. S. CARPENTER ON GAS PURIFYING AND TESTING.

It is with much pleasure that we draw the attention of our readers to the issue, in pamphlet form, of Mr. S. Carpenter's directions for working lime purifiers for the removal from coal gas of carbonic acid and sulphur compounds other than sulphuretted hydrogen. Mr. Carpenter is his own publisher, and has taken this means of rendering his great practical experience available for the instruction of gas managers in general. We have no hesitation in stating that both in regard to the working of purifiers and the solution of problems arising in connection with the hydraulic main (for which he has a patent) Mr. Carpenter is a safe guide, whose advice is well worth having. In the matter of purification, while it would be as unfair to disclose all the contents of Mr. Carpenter's pamphlet here, as it is admitted to be for a reviewer to tell a novelist's plot, it may be observed that the system in question is of the "rotation" type, involving three purifiers, of which two are always in action, and the other is a stand-by. Mr. Carpenter explains in full detail what every purifier does, when charged and arranged after his prescription, and how its performance is checked. He does not permit anything to be taken for granted, but gives full instructions for everything, beginning with the kind of lime to be preferred, and its preparation for use. Naturally, he finds chalk lime the best kind for employment in sulphur purification. Some lime, he remarks, will have after slaking a sandy feeling when squeezed in the hand; and this is not a good kind for purifying gas from carbonic acid and sulphur compounds. Happy the gas manager to whom chalk lime comes in the ordinary way of locally available supplies! He need not fear the gas examiner, like his less favourably situated brother, who must either put up with the gritty kind or pay dearly for the imported luxury of the purer article. In his remark as to the "feel" of lime, Mr. Carpenter unconsciously shows how the common-sense British foreman is accustomed to test his materials.

Those of our readers who are interested in the philology of technical terms—and we know them to be many—may be recommended to follow this observation of Mr. Carpenter's upon the feel of fat, pure lime, up to the traditional practice of the old-world grist miller, who was accustomed to gauge the result of his grinding by the feel of the meal between his forefinger and thumb. From constant use in this way, the latter member grew exceptionally flat, broad, and smooth. Query, was this the origin of the saying about working by "rule of thumb"? A very good rule it is too, in its proper place, and intelligently used for its proper end.

We do not desire to create the impression, however, that Mr. Carpenter is a "rule-of-thumb" man in the depreciatory sense of the term. That he is something very different will be understood from a sentence of his writing which we will quote entire. Speaking of sulphur purification, he says: "It is necessary that hydrogen be present to convert the lime into what was aforetermed 'hydrogenated' sulphide of calcium, which, as has been stated, has the power in a high degree of absorbing that stubborn impurity bisulphide of carbon." He claims to describe "the best and most practical way of purifying gas from carbonic acid, and the sulphur compounds other than sulphuretted hydrogen," in the light of 27 years' experience at the Bow Common Gas-Works, which should be a sufficient credential that he knows what he talks about. It will be remembered, as a curious point of the history of coal gas technics, that sulphur purification was in full swing at Bow at a period when the new principles of gas purification were being let loose upon Metropolitan Gas Managers, by the first Gas Referees, acting under the instigation of the late redoubtable Mr. R. H. Patterson.

Bound up in his pamphlet, Mr. Carpenter also gives a description of his short method of working off the sulphur test, with a table for calculating results. This handy guide appeals more particularly to "those gas-testers who are not qualified chemists, or who, through lack of time and pressure of other duties, are desirous of simplifying the process of testing, and minimizing the time necessary to be spent thereon." The table obviates the necessity for any calculation by the operator. The author complains that the official rate of gas consumption for the sulphur test is too slow. He prefers to pass gas at double this rate, or one cubic foot per hour, "as by so doing the services are kept in a more active state." This is effected by using a larger cylinder furnished with two nozzles, to which are connected two trumpet tubes; and two burners are used, each burning ½ cubic foot of gas per hour. For the sake of the saving of time, Mr. Carpenter says he a long time ago arrived at the conclusion that, in testing according to his own method, corrections for temperature and the state of the barometer can safely be neglected. The method in question is a cold process; and the author states that it gives results which are on the safe side, as being, on the average, slightly higher than those obtained by the boiling process as prescribed by the Referees. His practical hints on the conduct of sulphur tests are redolent of experience, and calculated to warn the youthful operator against pitfalls from which he would be liable to emerge with unreliable results.

WATER BILLS FOR 1895.

We complete to-day our notice, commenced last week, of the Private Bills in regard to the supply of water which will shortly come before Parliament.

The Edinburgh and District Water Bill is to enable the Edinburgh and District Water Trustees, who were first incorporated in 1869 for the purpose of supplying water to the city of Edinburgh, the town and port of Leith, the town of Portobello, and parts adjacent, to obtain an additional supply from the Talla Water, in the county of Peebles. The additional sum of £750,000 is required for the purposes of the Bill, to be paid off by a sinking fund accumulating at 1 per cent. compound interest, to be started ten years after the passing of the Bill. The contemplated works include a reservoir to be formed on the Talla Water, in the parish of Tweedsmuir and county of Peebles; a service reservoir at Fairmilehead, in the parish of Liberton, Midlothian; two railways in connection with the Caledonian system (the Symington, Biggar, and Peebles branch); and accessory pipe-lines and road works. The railways are only to be used for the purposes of construction; and the rails and sleepers are to be taken up and the land dealt with as superfluous land after completing the works. Running powers are to be taken over a part of the Caledonian Railway, to be exercised upon terms to be agreed upon between the Trustees and the Railway Company, or, failing agreement, by an Arbiter to be appointed by the Board of Trade, and subject to the Company's bye-laws and regulations for the time being in force. Powers are sought to temporarily divert, stop up, and otherwise deal with roads and bridges, with a saving clause for the rights of the Postmaster-General, and also for the works of any undertakers under the Electric Lighting Act. On taking the Talla Water, the Trustees are to discharge compensation water from their reservoir after the rate of 4 million gallons per day. A clause is inserted to authorize the Trustees to acquire the undertaking of the Liberton Water-Works Company. Lands required compulsorily are to be taken within five years, and the whole of the works executed within ten years. The Trustees are not to be bound to have the water constantly laid on under pressure at a greater height than 50 feet above the level of such streets as are more than 200 feet above Ordnance datum, until the expiration of seven years from the passing of the Act, or until the contemplated works have been completed. The Trustees may fence the reservoirs in any way they think proper; and may establish electrical communication between their works. Permission is sought for the discharge of water temporarily into any available watercourse, for the purpose of executing any necessary repairs. The limits of compulsory supply are to be extended to include the city of Edinburgh, the town and port of Leith, and the town of Portobello. Power is sought for supplying water in bulk to any public authority or person in the counties of Peebles and Midlothian, beyond the limits of the Act. All rates, rents, and charges imposed by the Trustees are to be made preferable claims.

The Kingston-upon-Hull Corporation Bill contains provisions relating to the water-works of the Corporation. It is stated that the outstanding debt on the undertaking now amounts to £317,540; and as it is desired to equate the periods of repayment for different Corporation loans, and to provide for their repayment by a sinking fund in all cases, it is proposed that this debt shall be repaid within 50 years from Jan. 1, 1896. The Corporation wish to include in one rate-book the assessments of all or any of the rates and water-rents which they are authorized to levy, and to be empowed to allow a rebate of not exceeding 1s. in the pound on all or any rates which are paid at the office of the Borough Treasurer within one month from the date of the service of the demand-note. All water and other rates are to be made recoverable as if they were poor-rates, but without prejudice to any other mode of recovery and enforcement now lawfully exercisable by the Corporation. Corporation stock is to be created. The water undertaking of the Corporation, including the Newington water undertaking transferred to them by the Newington Water Order, 1893, is to be vested in the Corporation, with power of maintenance, including the right to lay mains across the River Hull at Stoneferry, for the purpose of conveying water from their water-works to the east side of the river. A clause in the Act of 1843 relating to domestic supplies is defined as not covering a supply of water for baths, horses, cattle, or washing carriages, or for any trade or business whatsoever. Private houses within the water limits, and within 30 feet of the main, may demand a supply of water at a rate of 7 per cent. on the net annual value of the premises. Courts and alleys may be supplied by means of a common stand-pipe, for which every house is to be rateable. Nothing in the Act is to be construed as preventing the Corporation from entering into agreements for domestic supplies within the water limits, on such terms as may be agreed, but so that the same terms shall be offered to all persons in similar circumstances. Any other than domestic supplies are to be by meter, in the option of either party. Rates and rents for water are to be made recoverable in like manner as other rates or by civil process, at the option of the Corporation. The Corporation are to continue to supply the Cottingham District Council with water gratuitously, to the amount of 50,000 gallons per day, so long as they shall use the works at Cottingham, and

beyond this quantity up to 90,000 gallons per day at the price of 3d. per 1000 gallons.

The Merthyr Tydfil Local Board Water Bill is to authorize the Local Board to enlarge their undertaking, and to raise £120,000 for the purpose. The limits of supply are defined to be the Local Board district, and that part of the parish of Vaynor which is within the parliamentary borough of Merthyr Tydfil. Additional works are to be constructed, comprising an impounding reservoir in the parish of Llanfrynach, to be formed upon the River Tâf Fechan, to be called the Upper Neuadd reservoir, and the subsidiary pipe-lines. Certain common lands are to be taken. For the Company of Proprietors of the Glamorganshire Canal Navigation and the riparian proprietors it is provided that compensation water to the amount of a million gallons daily shall be discharged down the stream. The land is to be acquired within three years, and the reservoir constructed within four years; but the aqueducts and other works are allowed seven years for construction. The rates for domestic supply granted in an Act of 1858 are declared to be too low, and unremunerative. They are to be amended to range from 10 to 6 per cent. upon rateable value. A special rate is to be sanctioned for making up any deficiency of water revenue. The Rotherham Corporation Bill contains provisions to extend the water limits prescribed by the Act of 1863, so as to include the parishes or townships of Brinsworth, Whiston, and Dalton, in the West Riding. The Corporation seek to be empowered to make such investigations as they think fit in the watershed of the Little Don River, in the West Riding, with a view to obtaining an additional supply of water from that river and certain brooks, and to apply a sum not exceeding £5000 for the purpose of such investigations. It is not to be lawful for any person, for a period of two years, to construct any works, for the purpose of taking the waters in question, which were not authorized on Jan. 1 last. Additional water-works are to be constructed, consisting of a new pumping-station and well to be situated in the parish of Whiston, and connections. An agreement made between the Corporation and the Greasborough Local Board, set forth in a schedule, and providing for the supply of water by the Corporation to the Local Board for a period of 20 years, is to be confirmed. It is desired to extend the time-limit in the Act of 1882 for the completion of the works authorized by the Act of 1863, so far as relates to the Dalton reservoir, to May 17, 1910, subject to liability to compensate parties aggrieved by such extension of time. The Corporation seek power to give notice to discontinue pollution, by sewage or other offensive matter, of their sources of supply. Persons so notified are to cease polluting, under a penalty of £50, and £20 a day. After conviction, the Corporation desire authority to stop up outlets of sewers, &c.; exception being made in favour of the Rotherham Rural Sanitary Authority, so long as they properly clarify and disinfect the sewage of the districts of Dalton and Ulley. The sum of £30,000 is to be acquired for water-works purposes.

The sheaf of eight Bills promoted by the London County Council for procuring the transfer to the Council of the undertakings of the London Water Companies stand in a special category apart from ordinary schemes of legislation of the kind. Their titles are: The Chelsea Water-Works (Transfer) Bill, the East London Water-Works (Transfer) Bill, the Grand Junction Water-Works (Transfer) Bill, the Kent Water-Works (Transfer) Bill, the Lambeth Water-Works (Transfer) Bill, the New River Water-Works (Transfer) Bill, the Southwark and Vauxhall Water-Works (Transfer) Bill, and the West Middlesex Water-Works (Transfer) Bill. The preambles of the different Bills run on the same lines; but they are drawn in accordance with the various circumstances of the different undertakings. They may be briefly described as reciting, first of all, the Acts of Parliament under which the particular Company are incorporated. The statutory limits of supply are next stated, followed by explanations of the manner in which these limits are trenched upon by other Companies, and the extent to which they are occupied by the Company. A clause then declares that the charges which the Companies are authorized to demand for water differ in amount, and the powers and obligations of the several Companies with regard to supply and pressure also vary. Any mutual arrangements which the Company may have made with other Companies for the avoidance of competition is noted. Next the state of the Company's capital powers and obligations and capital account is given; and the preambles conclude with the common paragraph declaring that it is expedient that provisions such as are in the Bill contained should be made for the transfer of the undertaking of the Company to the London County Council, and that the Council should have the powers of the Company and such others as are in the Bill mentioned with respect to the supply of water in the portions of the Company's district without London. The term "undertaking" is defined to mean the water-works and works connected therewith, and all property, real and personal, money, securities, and effects, and all rights, powers, authorities, and privileges of the Company. It is proposed that, as from the date of the Act, so much of the Special Acts of the Company as excepts from incorporation therewith section 35 of the Water-Works Clauses Act, 1847, shall be deemed to be repealed, and the section to be incorporated in the Company's Acts; the inconsistent clause in the latter being repealed. It is desired that power should be given for the Company and the Council to enter into and carry into effect any agreement for sale and transfer to the Council of the undertaking or any part thereof, subject to debenture charges, and on such terms as may be agreed upon between them. Unless such agreement has been concluded between the parties before March 31, 1896, or within an agreed extended period, the undertaking is, as and from this date, to become transferred to and vested in the Council, on such fair and reasonable terms, having regard to all the circumstances of the case, as, failing agreement, may be determined by arbitration. The Company are to be permitted to retain a sum of money for defraying any costs to which they may become liable subsequent to the transfer; such sum to be taken into account in the final adjustment. The Company are to appoint one Arbitrator and the Council another —an Umpire is to be chosen between them; and the Arbitrators may have the services of an expert assessor. In determining the fair and reasonable value of the undertaking, the matters, among others, to be taken into consideration are described as being these: The condition and state of repair of all works and plant, together with any liabilities in connection with the undertaking which the Company may reasonably be expected to incur; the legal powers of the Company to take water, and the probability of such powers being limited; the adequacy and sufficiency of the present sources of supply and of the plant to meet present and future requirements; the probable necessity of the future introduction of a new source of supply or new or improved works; the legality of the Company's charges, and the circumstances under which such powers of charge have been granted by Parliament; the deductions from any compensation claimed by the Company which may, in the opinion of the Arbitrators, be reasonably made in respect of any insufficiency of the present storage or filtration, or of the provision of supplementary supplies; the deductions to be made in respect of any obsolete works, and the adjustment of the revenue account in respect of properly chargeable repairs and renewals; the statutory powers of any other company or body to compete in the Company's district in the present or the future; the effect of the amendment of the Company's Act by the incorporation therewith of section 35 of the Water-Works Clauses Act; and there is to be no allowance for back dividends, prospective increase of value, or compulsory sale. Metropolitan stock is to be made issuable in payment for the undertaking. Powers of inspection are demanded; and the treatment of the debenture-holders is set forth in detail. Directors are to be compensated for any direct pecuniary loss they may suffer from the execution of the Act; and officers and servants are to be either compensated on retirement or retained. The dates and terms of certain of the operative clauses differ with some of the Companies. The suburban authorities are to be empowered to purchase outlying portions of the undertakings.

NOTES.

A High-Speed Gas-Engine.

An improvement in gas-engines is claimed, with apparent justification, for the "Dawson High-Speed" motors, which are also capable of being worked by oil vapour. Several types of these engines are made for different classes of work; all of them running at speeds comparable with those of the high-speed steam-engines that have become so popular of late years. The rotary piston type of Dawson engine greatly resembles in appearance the well-known Willans steam-engines. It has no valves besides the gas admission-valve, and no levers, cams, springs, or other complications of the driving parts. The whole of the internal operation of the motor is effected by the piston itself, which is hollow, and has ports in its sides. As the piston revolves as well as reciprocates, it takes in turn the admission, ignition, and exhaust positions with relation to the fixed ports in the cylinder. In this way also the wear is equally distributed over the rubbing parts, so that there is no possibility of the piston or cylinder wearing oval. The whole of the working parts are enclosed in a case, The crank works in an oil bath, and splashes the lubricant over the slides. Speeds up to 1600 revolutions per minute are attained in the small sizes. The system lends itself to the construction of large gas-motors; an engine of 200-horse power having been designed, which is to occupy a floor space of less than 12 ft. by 5 ft. 6 in., and about 10 ft. high. An illustration of a Dawson 50-horse power engine, with diagram taken at a speed of 600 revolutions per minute, recently appeared in *Engineering*.

Wind Pressures at Bidston.

Mr. W. E. Plummer writes to *Nature* respecting storm statistics obtained at the Bidston Observatory. It has been the practice at this establishment to regard as storms, or gales, all occasions on which the Robinson anemometer records the horizontal velocity of the wind as attaining or exceeding a velocity of 50 miles an hour. In 28 years, this has happened 321 times, or an average of slighly below one a month. The greatest number recorded in a year was in 1868, when 28 gales were reported; and the smallest fell in 1880, when there were only two, and these neither severe nor of long continuance. There is some indication of the existence of a quinquennial periodicity of these gales, both in frequence and severity. In the pressure of wind recorded per square foot, Bidston has long held a record for the British Isles; having placed to its credit

a pressure of 90 lbs. on March 9, 1871. It is admitted, however, that this is too great as an indication of the real force of the wind, and must be ascribed to the momentum of the instrument. Mr. Plummer makes the average maximum hourly velocity for all storms 58·4 miles, and the mean of the maximum pressures 37·6 lbs., merely as a matter of figures; but he does not set any value upon the calculation. Although the Bidston figures do not seem to be very valuable as records of fact, they are fairly comparable between themselves; and they at least indicate the average duration of storms. There are only two instances of gales lasting 30 hours; and usually the greatest velocity of the wind only endures for 5·4 hours, which is the average over 28 years. An examination of the dates when gusty weather is most prevalent does not substantiate the ancient myth of the equinoctial gales, or uphold the evil supremacy long assigned to the winds of March. February is shown to possess the record of compressing within its shortened limits more tempestuous weather than any other month. Three-fourths of the storms of a year usually occur within the five winter months, from November to March inclusive.

Inutility of the Hot Test for Portland Cement.

Mr. F. H. Lewis and Mr. J. E. Whitfield have communicated to the American Society of Engineers some observations upon hot tests for Portland cement which are based upon a continuous trial of a hot-water apparatus for upwards of a year. The hot bath and steam chamber were generally kept uniformly at 180° Fahr. Only occasionally has the late Mr. Faija's advocated temperature of 115° Fahr. been employed. At the outset, the hot tests appear interesting and convincing. The contrast is sharp between those pats which come out sound, firm, and metallic, and those showing deterioration. In the course of experiments with lime, however, the authors came to think it questionable whether free lime in cement is not something of a bugbear. If hard-burnt lime is passed through a No. 74 sieve, it soon ceases to be caustic; going quite dead on a few days' exposure to the air. Now, a thoroughly hydrated lime is no detriment to a cement. On the contrary, the strongest sand mortars are made with mixtures of well-slaked lime and Portland cement. The authors made a mixture of two-thirds cement and one-third slaked lime, and added two parts of sand to one of the mixture. The briquettes showed a tensile strength of 423 lbs. in seven days, and 583 lbs. in 28 days. Pats of this mixture of cement and lime also stood boiling tests perfectly, whether made up with fresh or with sea water. The authors have arrived at the conclusion that, as a test of free lime, the high-temperature bath does not commend itself. Whether it is useful on other accounts is held to be matter of doubt.

A Combination Sewage-Destruction Scheme.

An extraordinary project for the treatment and removal of house refuse and sewage has been patented by Mr. R. C. Sayer, of Bristol. This inventor proposes to treat all such refuse by heat, with the objects of rendering it innocuous and of utilizing the residues. He puts the matter into closed destructor furnaces, with or without the addition of fuel, whereby gas is produced. A portion of the heat of the furnaces is to be used for generating steam, which drives an air-compressor. Part of the compressed air from this is heated and injected through tuyeres into the furnace; while another part, together with some of the gas from the destructor, is to be distributed through pipes to the houses in the district served by the plant. The gas and air mixture is to be supplied to, and utilized in "cabinets," in which the solids and liquids of the night-soil are to be separated. The former is to be reduced by heat raised by the gas in burning with the compressed air, until the residue is drawn away by suitable means through pipes. The residue unites with the "foul air from rooms," and with the products of combustion from the house fires, after these have been purified by washing with water, air is drawn back to the destructor along suitable conduits. Here it is further reduced by jets of gas and compressed air. The dust residues obtained in this way are to be used for manure; and the gaseous ones, after washing with water, pass away into the atmosphere. The purifying water is to be used over again after filtration through a combustible material, and the latter, when saturated, is to be burnt in the destructor as fuel.

Incandescent Gas Lighting in the Patent Office Library.—A short time ago, complaint was made, in one of our technical contemporaries, of the defective lighting of the Patent Office Library. As the gas-fittings were of a somewhat antiquated character, we can personally testify that the complaint was not altogether uncalled-for, especially in view of the fact that a good deal of work is done there between six and ten in the evening. A welcome improvement has now been made by the introduction of incandescent gas-lights in the reading-room; and we presume the system will be extended to other parts of the library. As the number of readers in the week ending the 26th ult. was 2422—a large proportion of them, we may parenthetically remark, having reached an age when the sight is not at its best—there is unquestionable evidence that the value of the library is appreciated; and in their latest addition to it, the authorities have given another proof of their desire to enhance its utility as a public institution.

COMMUNICATED ARTICLES.

THE BEHAVIOUR OF THE TYPHOID BACILLUS AND OF THE BACILLUS COLI COMMUNIS IN POTABLE WATER.

By Dr. Percy Frankland, F.R.S.,
Professor of Chemistry in Mason College, Birmingham.

The wide divergence which exists in the results obtained by previous observers on the vitality of the typhoid bacillus in water, has induced me to re-investigate this subject, more especially with a view to determine the longevity of this bacillus in definite types of British potable water, of which the exact chemical composition was also carefully ascertained.

The method adopted throughout for the detection of the Typhoid bacillus and the *Bacillus coli communis* in unsterilized waters was that devised by Parietti; consisting in the addition of phenol along with hydrochloric acid in certain proportions to neutral broth. To tubes containing this mixture, from one drop to several cubic centimetres of the water under investigation were added and placed in the incubator at 37° C. On the tubes becoming turbid, they were submitted to ordinary plate cultivations; and on the development of colonies the latter were invariably submitted to—

(1) Microscopic examination.
(2) Inoculation on to potatoes, and comparison of growths with that of simultaneous cultures of the typhoid bacillus on the same potatoes.
(3) Inoculation into broth, and examination of the broth-culture after 48 hours' growth in the incubator at 37° C. for indol, which, if it is the typhoid bacillus, should be absent.
(4) Inoculation into milk, which should not subsequently become coagulated on keeping for one week in the incubator.
(5) Inoculation into a tube containing melted gelatine-peptone. On distributing the bacilli in this, and then congealing the gelatine, no gas bubbles should be formed on keeping at 18° to 20° C., while in the case of the *B. coli communis*, bubbles will make their appearance in from 12 to 48 hours.

This systematic investigation of the behaviour of these two micro-organisms in water is not only attended with considerable difficulty, but involves an enormous amount of labour, which is, however, well worth bestowing in consideration of the very great importance attaching to the question at issue.

The first series of experiments was made to ascertain the vitality of these two organisms in unsterilized Thames water. The following is a brief summary of the results obtained.

The unsterilized Thames water infected with typhoid bacilli contained them in a living condition 25 days after infection, both in that portion of the water which had been preserved at 19° C., and in that kept at 6° C.; the number and vital activity of the typhoid bacilli being apparently greater in the latter than in the former. Thirty-four days after infection, they had disappeared in both portions of the water.

The same unsterilized Thames water, infected with the *B. coli communis* on the same day, and kept under precisely similar conditions of temperature, &c., was still found to contain living coli bacilli 40 days after their introduction. These bacilli doubtless persisted in the living state, even for a much longer period of time than this—no later examinations being made; and on the occasion of their last detection, they did not appear to have lost any of their original vitality, as they still promptly reacted with the phenol broth test.

It should here be mentioned that, in all these investigations, special precautions were observed to avoid the introduction of organic matter as far as possible into the waters under investigation; and, in order to ascertain whether or not the infection of the water had communicated any large amount of organic matter to it, some of the infected waters were submitted to partial chemical analysis, and compared with results obtained with the same water before infection. The chemical examination showed that the infection had not caused any material difference in the chemical composition of the water.

In the next series, experiments were made to ascertain if the addition of salt to the unsterilized Thames water infected with typhoid bacilli had any effect on the vitality of the latter. This point is of importance and interest, inasmuch as it has been shown by Trenkmann (*Centrlb. f. Bakt.*, Vol. XIII., 1893, p. 313) that the addition of sodium chloride and other salts in certain proportion to water containing cholera bacilli favour their multiplication in a very remarkable manner. Common salt was added to the unsterilized Thames water in the proportion of 0·1, 1·0, and 3 per cent., and the following summarizes the results obtained:—

(1) The addition of the salt stimulated the growth and multiplication of some of the water bacteria to an enormous extent—the effect being the most marked with the largest proportion of salt (3 per cent.); while the water to which only 0·1 per cent. of salt was added behaved almost exactly like the untreated Thames water.

(2) This multiplication was, as usual, followed by decline; but the saline waters remained, even after six weeks, more densely, and with the larger proportion of salt much more densely, populated than the Thames water to which no salt was added.

(3) As regards the effect of the salt addition on the typhoid bacilli present in the water, the experiments showed that they were most prejudicially influenced. Thus while on the eighteenth day after infection the typhoid bacilli were easily demonstrable in the ordinary unsterilized Thames water to which no salt had been added, and also in that which had received 0·1 per cent. of salt, and which had been kept at 6° to 8° C., they were not discoverable in any of the waters to which 1 and 3 per cent. of salt had been added, nor in that which had received only 0·1 per cent. of salt, but which had been kept at the summer temperature of 19° C.

(4) In the case of the 3 per cent. addition of salt, I am of opinion that the rapid disappearance of the typhoid bacilli is largely due to the direct action of the salt; while in the case of the smaller proportions it may also be due to the great multiplication of some of the common water bacteria. The directly prejudicial action of the salt on the typhoid bacillus was further demonstrated by the addition of salt to steam-sterilized Thames water containing typhoid bacilli.

A further series of experiments made with steam-sterilized Thames water to which 1 per cent. of salt was added, fully confirmed these results; for it was again found that this addition, while enormously stimulating the multiplication of many of the forms of water bacteria, exerted a directly and highly prejudicial effect on the typhoid bacilli, causing their rapid disappearance from the water whether water bacteria were present or not. Thus, at the end of twelve days, they were only just discoverable by phenol-broth culture, and on the nineteenth day were absent, whilst in the same water to which *no* salt had been added they were easily discoverable by phenol-broth culture on the nineteenth day. A point of interest in this connection was the appearance of the typhoid colonies obtained on plate cultivation of the phenol-broth tubes which had been rendered turbid by these infected saline waters. They assumed in some cases a very abnormal appearance; being irregularly swollen and lobulated in the depth, and often giving rise to whip-like prolongations into the surrounding gelatine. As far as I am aware, such abnormally-formed typhoid colonies have not been previously observed. I am inclined to attribute them to the degeneration of the typhoid bacilli; for, on passing such colonies through a further process of plate cultivation, only the normally-formed typhoid colonies were obtained.

Attention was next directed to the behaviour of these organisms in River Thames water previously sterilized by steaming. The *B. coli communis* presented a marked contrast to the typhoid bacillus in respect of its behaviour in this water. Thus, at the commencement of the experiment, both bacilli were present in about the same numbers; the typhoid-infected water containing 74,000, and the coli-infected water 69,000 bacilli per cubic centimetre respectively. But while the subsequent numbers found in the typhoid-infected waters were invariably less than this initial number, in the case of the coli-infected waters the initial number was subsequently very greatly exceeded; the observed multiplication being greatest in the water kept at a summer temperature. This multiplication was afterwards followed by a corresponding decline; but even at the end of the 75 days over which the observations were extended, the number of the coli bacilli greatly exceeded that of the typhoid bacilli. It is, moreover, worthy of remark that the coli-infected water kept at 19° C., in which the most extensive multiplication took place, ultimately contained a smaller number of coli bacilli than the water maintained at 6° C., in which the multiplication had been less considerable. Thus, in steam-sterilized Thames water, typhoid and coli bacilli were still present in a living state, irrespectively of whether it had been preserved at a summer or a winter temperature, for a period of 75 days.

The behaviour of the typhoid and coli bacilli in Thames water sterilized by filtration through porous porcelain was next examined. The results obtained were most unexpected; for although as many as 75,000 typhoid bacilli per cubic centimetre were introduced into this water, they were entirely destroyed in five days at 19° C., and had undergone a very large reduction in number at from 6° to 8° C., while at the latter temperature they were no longer discoverable in twelve days. Precisely similar results were obtained with the coli bacilli. These bacilli were, therefore, more rapidly destroyed in the porcelain-filtered than in the unsterilized Thames water, and far more rapidly than in the steam-sterilized Thames water.

The most obvious suggestion was that the filter itself might have introduced some antiseptic substance into the water. In order, therefore, to abolish any suspicion of this, although the filter in question had only previously been used for the similar sterilization of Thames and Loch Katrine waters, the porcelain cylinder was thoroughly scrubbed externally with a brush, and then upwards of 30 litres of distilled water passed through it. However, on repeating the experiment, precisely similar results were obtained. Results of a like character were also subsequently arrived at with other waters sterilized by filtration, in some of which totally different filters, constructed of infusorial earth, were employed.

Having, in the previous experiments, determined the behaviour of these bacilli in a typical calcareous surface water like that of the Thames, which receives the drainage from cultivated land, I proceeded in the next instance to carry out a somewhat similar series of experiments with Loch Katrine water, which may be taken as a type of an upland surface water derived almost exclusively from uncultivated land, and of a somewhat peaty character.

The sample of this water was collected from a tap on the main in Glasgow, and, submitted to plate cultivation on the spot, was found to contain 112 bacteria per cubic centimetre. In infecting this water with typhoid and coli bacilli, precisely the same precautions as regards the carrying over of culture material were observed, and the water was, as in the case of the Thames samples, submitted to chemical analysis before and after infection, so as to ascertain with certainty that no appreciable increase had taken place in the organic matter present. The following is a brief *résumé* of the results obtained: The *B. coli communis* was still alive in the unsterilized Loch Katrine waters (kept both at winter and summer temperature) seventeen days after infection. The typhoid bacillus was also still alive in the similar water kept at the winter temperature (6° 8° C), while it was found to be extinct in the same water kept at the summer temperature of 19° C.

In steam-sterilized Loch Katrine water, the typhoid bacilli underwent rapid degeneration—the rate of their decline being more rapid at the summer than at the winter temperature; for at the higher temperature they were no longer demonstrable seventeen days after infection, while at the lower temperature they were still just discoverable even after twenty-one days. In Loch Katrine water sterilized by filtration through porous porcelain, the typhoid bacilli underwent rapid degeneration, more especially in the water which was preserved at the summer temperature, in which they were no longer found twenty-one days after infection; while in the same water kept at the winter temperature, they were still easily recognizable, although in greatly diminished numbers on the twenty-first day.

It is particularly noteworthy that the behaviour of the typhoid bacilli was practically identical in this Loch Katrine water, irrespectively of whether it was employed in the unsterilized or in the sterilized condition, and irrespectively of whether the sterilization was effected by steam or by filtration through porous porcelain. In all cases, moreover, the effect of temperature on the typhoid bacillus was very marked; the longevity being much greater in the Loch Katrine water, unsterilized or sterilized, kept at the winter, than in that kept at the summer temperature. The *B. coli communis* disappeared in the steam-sterilized Loch Katrine water in a surprisingly short time, being no longer demonstrable on the seventeenth day after infection. In this case also the decline was more rapid in the water kept at a summer than in that at a winter temperature. In the porcelain-filtered Loch Katrine water the coli bacilli were just discoverable in very small numbers (four in a cubic centimetre) on the twenty-first day after infection in the sample kept at the summer temperature; but on the following day none were found in either sample kept at the winter and summer temperature respectively.

In the above series of experiments with Loch Katrine water, the typhoid bacilli had been introduced in smaller numbers than was the case in the Thames water experiments. In order, therefore, to make the results obtained with these two different classes of water comparable, I started another series, in which I introduced the typhoid bacilli in much larger numbers into the Loch Katrine water. This was the more desirable as I have found, in previous investigations of the same kind, that one of the factors determining the longevity of pathogenic bacteria placed in water, or in any unfavourable surroundings, is the absolute number in which they are present. That where, for example, among 1000 bacteria taken from a given source, there may be *some individuals* which will resist a particular adverse influence, if only 10 bacteria be taken from the same source it is possible there may be *none* capable of resisting the adverse influence in question. On introducing typhoid bacilli in large numbers into the unsterilized Loch Katrine water, it was found that their persistence was greater than when only small numbers were employed; for they were still easily discoverable on the fourteenth day after inoculation, while in the previous experiments they were no longer demonstrable in the unsterilized water which had been kept at a summer temperature (19° C) for eleven days.

From these experiments, it is obvious that the longevity of the typhoid bacillus in any particular water is subject to very considerable variations according to the initial vitality of the typhoid bacillus employed, and according as a relatively large or small number of the bacilli are introduced into the water. In order, therefore, to institute a comparison between several different waters, as to their relative capacity of maintaining typhoid bacilli in a living state, it is absolutely essential that the typhoid bacilli placed in the several waters should be taken from one and the same cultivation; and that they should be introduced in each case as far as this was possible in the same numbers.

These were the conditions that were secured in the next series of experiments, in which three different types of water, were employed—*i.e.*, River Thames water, Loch Katrine water and deep-well water derived from wells which had been sunk into the chalk.

The following chemical analysis of these different waters serves to indicate their various characters :—

Results of Analysis expressed in Parts per 100,000.

	Thames Water.	Deep-Well Water (Kent).	Loch Katrine Water.
Total solid matter	26·200	44·400	2·400
Organic carbon } by combustion	0·172	0·058	0·189
Organic nitrogen } by combustion	0·036	0	0·024
Organic nitrogen (Kjeldahl process)	0·046	0·013	0·016
Ammonia (free)	0·005	0	0
Ammonia (albuminoid)	0·013	0·001	0·001
Oxygen consumed by organic matter	0·083	0·013	0·147
Nitrogen as nitrates and nitrites	0·175	0·467	0·007
Total combined nitrogen	0·215	0·480	0·031
Chlorine	1·750	2·500	0·650
Temporary hardness	13·700	21·100	0
Permanent ,,	4·200	8·600	1·000
Total ,,	17·900	29·700	1·000
Remarks	Turbid.	Clear.	Very slightly turbid.

Each of these waters was simultaneously experimented with in the natural unsterilized state, also after sterilization by steam, as well as after sterilization by filtration through a porous cylinder composed of baked infusorial earth. These nine different kinds of water were all infected at one time with the same quantity of typhoid bacilli taken from one and the same cultivation.

For this purpose, an agar-cultivation of sixteen days' age, and grown at from 18° to 20° C., was employed. Forty needle loops were carefully taken from the surface of this cultivation, and thoroughly mixed by prolonged agitation with 50 c.c. of sterilized tap water. Of the water-attenuation thus prepared, 4 c.c. were added to 1000 c.c. of each of the nine different kinds of water. Each of these infected waters was subdivided among several sterile flasks. The mouths of these flasks, instead of being plugged with cotton wool, were in this series of experiments simply covered with sterile beakers. All these flasks, together with similar flasks containing each of the three unsterilized waters not infected, were placed in a dark cupboard, in which prevailed an almost uniform temperature of 9° to 12° C.

In order to ascertain the effect on the bacteria of keeping the waters at rest and in motion respectively, one flask was kept at rest, and only shaken up when a sample was to be taken from it, while the other was every day submitted to violent agitation over a period of five minutes; this agitation being repeated two or three times on the same day.

The waters were all periodically examined by plate cultivation and phenol-broth culture, as was done in the case of all the other experiments. The following summarizes the results of these various investigations :—

River Thames Water.—The bacteria in the uninfected Thames water underwent very considerable multiplication. In the typhoid-infected Thames water (about 16,000 per cubic centimetre of typhoid bacilli were introduced), the typhoid bacilli were no longer demonstrable nine days after their introduction. In the steam sterilized Thames water, the typhoid bacilli underwent no multiplication, but, on the contrary, steady diminution; being last discovered thirty-two days after introduction. In the Thames water, sterilized by filtration through a porous cylinder constructed of infusorial earth, their disappearance was far more rapid. They were no longer discoverable eleven days after their introduction, and had doubtless died off even before this. (These results confirm those previously obtained with Chamberland cylinders of porous porcelain.)

Loch Katrine Water.—The bacteria in the uninfected Loch Katrine water underwent no multiplication, but, on the contrary, slight decline. In the infected water, typhoid bacilli were introduced to the extent of about 22,000 per cubic centimetre; but they were discovered for the last time nineteen days after their first introduction. In the steam-sterilized Loch Katrine water, the typhoid bacilli underwent no multiplication, but, on the contrary, a steady decline; the last surviving individuals being, however, remarkably persistent. Thus typhoid bacilli were still discoverable fifty-one days after their first introduction. In the Loch Katrine water rendered sterile by filtration through a porous cylinder of infusorial earth, typhoid bacilli were still discovered thirty-nine days after their first introduction. This confirms what I found in the previous series of experiments—viz., that the typhoid bacilli persisted much longer in the porcelain-filtered Loch Katrine water than in the porcelain-filtered Thames water.

Deep-Well Water.—The water bacteria in the deep-well water underwent much more extensive multiplication than in either the Thames or the Loch Katrine water. The typhoid bacilli were last discovered in this water thirty-three days after their first introduction. In the steam-sterilized deep-well water, the typhoid bacilli were incapable of multiplication, and, on the contrary, underwent continuous decline in numbers. They were last discovered twenty days after introduction; while after being in the water for thirty-two days, they were no longer discoverable. In this connection, it is particularly noteworthy that typhoid bacilli were discovered in the unsterilized deep-well water some days later than in the steam-sterilized deep-well water; thus showing that in this deep-well water their longevity was unaffected by the circumstance of whether the water was sterilized or unsterilized. In the case of both the Thames and Loch Katrine waters, on the other hand, the longevity of the typhoid bacilli was much greater in the sterilized than in the unsterilized water. In the deep-well water sterilized by filtration through cylinders of infusorial earth, typhoid bacilli again disappeared with remarkable rapidity; being no longer discoverable eleven days after their introduction.

In order to test whether or not the rapid disappearance of the typhoid and coli bacilli in these porcelain-filtered waters was due to the presence of any antiseptic substance, I took about 100 c.c. of porcelain-filtered typhoid-infected deep-well water, in which the typhoid bacilli were extinct, and treated them with three drops of the unsterilized uninfected deep-well water containing about 3000 water bacteria, so that the former received an addition of about 30 water bacteria per cubic centimetre. Three days after the addition, 10,462 bacteria per cubic centimetre were found; while after twelve days the number had increased to 603,900 bacteria per cubic centimetre. It is obvious, therefore, that in this same water, in which the typhoid bacilli were so rapidly destroyed, some, at any rate, of the common water bacteria present in the unsterile deep-well water were able to multiply to an enormous extent, and with wonderful rapidity. This, therefore, removes all suspicion of any antiseptic substance having accidentally gained access to the water in the process of filtration through these porous cylinders. As regards the effect of agitation in these experiments, it appears that the agitation on the whole promoted the multiplication of the water bacteria in the unsterilized waters, while it somewhat accelerated the disappearance of the typhoid bacilli in the infected sterile waters.

From these comparative experiments with sterilized Thames, Loch Katrine, and deep-well waters, it is evident that in none of the waters does the typhoid bacillus proliferate; the longevity of the bacilli being greatest in the Loch Katrine, and least in the deep-well water. On the other hand, in the unsterilized waters, their longevity is decidedly greatest in the deep-well, and decidedly least in the Thames water. In the sterilized water, the principal factor determining longevity would, therefore, appear to be the proportion of organic matter present, which is much greater in the Loch Katrine and Thames than in the deep-well water. On the other hand, in the unsterilized water, the factor determining longevity must be an entirely different one; and, whatever it may be, it is more conspicuous in the case of the two surface (Thames and Loch Katrine) than in that of the subterranean (deep-well) water. It is generally believed that the more rapid disappearance of pathogenic bacteria in unsterile than in sterile waters is due to the multiplication or competition of the common water bacteria in the unsterile waters. But these experiments clearly show that this cannot be true—at any rate without qualification; for it was precisely in the case of the deep-well water that the most extensive multiplication of the water bacteria took place.

In order to further examine this point, experiments were next made to determine the relative longevity of the typhoid bacillus in unsterilized Thames water and in steam-sterilized Thames water re-inoculated with Thames water bacteria. In this series, instead of taking the surface growth of a well-matured typhoid culture, I selected typhoid colonies from fresh plate-cultivations; procuring in this manner the typhoid bacilli in a very vigorous condition for the subsequent infection of the waters which were placed in sterile flasks covered with beakers, and preserved in a dark cupboard at a temperature of 9° to 11° C. This series included—

(1) Typhoid-infected unsterilized Thames water.
(2) Typhoid-infected steam-sterilized Thames water.
(3) Typhoid-infected steam-sterilized Thames water inoculated with a few drops of unsterile Thames water.

Typhoid bacilli were still demonstrable in the typhoid-infected unsterilized Thames water twenty days after introduction; but seven days later they were no longer discoverable. In the steam-sterilized Thames water, typhoid bacilli were found throughout the entire period of forty-eight days over which this series of experiments extended. In the typhoid-infected steam-sterilized Thames water, which had been artificially rendered unsterile by the introduction of a few drops of unsterilized Thames water, the typhoid bacilli were still demonstrable thirty-four days after introduction, while seven days later they were no longer discoverable.

Thus not only was the longevity of the typhoid bacilli far greater, as usual, in the sterilized than in the unsterile waters, but of the two unsterile waters (the one naturally so, and the other rendered so artificially), the former proved to be decidedly more antagonistic to the vitality of the typhoid bacillus than the latter. This is of interest and importance, for examinations of the naturally unsterile uninfected Thames water showed that no multiplication of the water bacteria present took place; while in what we may call the artificially unsterile water, a very large multiplication of the introduced water bacteria did take place. It will be remembered that it was likewise in the deep-well water, in which the bacteria present underwent multiplication, that the typhoid bacilli enjoyed a greater longevity than in either unsterile Thames or Loch Katrine water.

To what, then, can be attributed the antagonistic action of the unsterile waters on the typhoid bacillus? These experimental observations, I consider, indicate that the lethal action of these unsterile waters is not attributable to the multiplication of the water bacteria present leading to the suppression of the typhoid bacilli "by competition in the struggle for existence," but rather through the existence in the unsterile waters of

conditions that are inimical to the vitality of the typhoid bacillus, due, doubtless, to a great extent, to the presence of chemical products elaborated by water bacteria.

This shorter duration of life of the typhoid bacilli in naturally unsterile Thames water than in that rendered unsterile by inoculation, I attribute to the circumstance that, in the naturally unsterile Thames water, countless generations of water bacteria must have flourished before the water is made the subject of experiment at all; and it must, therefore, be more or less saturated with these bacterial products which are prejudicial to the vitality of the typhoid bacillus, and which, in fact, frequently hamper, or even inhibit, the further multiplication of the water bacteria themselves.

Thus it is obvious that the unsterile water in question was already, at the outset of the experiment, in such a condition as to prevent any multiplication of its own water bacteria; while, after it had been steam-sterilized, and the bacterial products destroyed, the same bacteria multipled abundantly in it. But, again, at the outset of the experiment, the unsterile water was in such a condition as to cause a comparatively rapid disappearance of the typhoid bacilli that were introduced; while after steam-sterilization it only became again endowed with this power of destroying the typhoid bacilli when the introduced water bacteria had undergone extensive multiplication.

The concluding series of experiments was conducted to ascertain if the typhoid bacilli could, by training or education be induced to multiply in water. If, instead of suddenly plunging the typhoid bacilli from an ordinary cultivation into water, they were gradually transferred to media more and more weakened or diluted with water, it appeared to me possible that they might in this way present a different behaviour when finally introduced into potable water. I proceeded by gradual, steps until I had induced typhoid bacilli to grow in a broth consisting of 1 volume of broth mixed with 99 volumes of water. After continuously cultivating typhoid bacilli in this medium for a period of two months, they were employed for infecting steam-sterilized Thames water. For this purpose, two drops of this very dilute broth cultivation (three days old) of the typhoid bacillus were added to 600 c.c. of steam-sterilized Thames water, which was submitted to plate-cultivation on the day of infection, and on several subsequent occasions, thus:—

Days on which Plates were Prepared.	Number of Days Plates were Incubated.	Number of Typhoid Bacilli in 1 c.c. of Water.
1st day	8	4,895
3rd ,,	7	15,372
6th ,,	10	11,184
13th ,,	7	6,558
24th ,,	7	5,795
35th ,,	6	6,068
39th ,,	9	4,093

Thus unquestionable, although not very extensive, multiplication of the typhoid bacilli took place in the water thus infected. But, in order to be quite sure that this multiplication had not taken place at the expense of the very small amount of organic material introduced, I took 10 c.c. of the above water, on the day when it contained 5795 typhoid bacilli per cubic centimetre, and added them to 20 c.c. of steam-sterilized water. Now, if the bacilli were endowed with the power of multiplying, they should be able to do so in this sample of water, in which the organic matter since sterilization had not been exposed to bacterial life. But throughout the series of plate-cultures which were prepared from this water, the typhoid bacilli exhibited a steady decline in numbers.

From these experiments, it appears that typhoid bacilli which have undergone a prolonged and gradual training in more and more aqueous culture-media do exhibit distinctly more vitality in potable water than bacilli taken direct from highly nutritive solid media, such as agar or peptone jelly. On the other hand, there is considerable reason for believing that the slight, but distinct, multiplication which these trained bacilli undergo in potable water, is effected not at the expense of the organic matter belonging to the water itself, but at the expense of small quantities of food material introduced along with them at the time of infection, and that the latter circumstance explains the extensive multiplication of typhoid bacilli in potable waters observed by some investigators.

ACETYLENE AND THE GAS INDUSTRY.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

The discovery by Mr. L. T. Willson of a process or the commercial manufacture of acetylene, which turns out to be the subject of the paper read before the Society of Arts on the 16th ult., is one that may well be calculated to raise a great deal of interest. It is a pity, however, it was not more clearly indicated by the title. Such a general expression as "The Commercial Synthesis of Illuminating Hydrocarbons," is deceptive, as not being likely to lead one who was not in the secret to expect a detailed account of some particular new process. "Sensation" is all very well in theatrical entertainments; but surprising situations are somewhat out of place in connection with commercial science. Had the real nature of the lecture been indicated, there would have been no necessity for making arrangements to secure an audience. But, after allowing for the personal eloquence and ability of Professor Lewes, it is evident that his subject possesses special fascinations that could not fail to attract and rouse the enthusiasm of his audience. Gas engineers, accustomed to deal with residuals such as coke, tar, and liquor, may well stand entranced before a complete gasification process leaving no residual, and calling for no second material as fuel or as enricher. This seems to be afforded by the process described. Given practically pure carbon and lime, the whole of the former is eventually obtained as a gas, while the latter simply acts as a carrier, and returns to its original form. The results approximate closely to theory; and there is no waste. The calcium carbide can be caused to yield its quota of gas by a beautifully simple and almost costless method, but little more troublesome than the trimming of an oil-lamp. The fact that a single pound avoirdupois of this remarkable material can be made, by the aid of a few ounces of water, to furnish a brilliant light for ten hours, and at the same time leave a useful residual, is a triumph of modern science. It seems to me that it cannot fail to secure a future for the new compound, in the direction of compressed gas lighting for buoys, for railway carriages, and so forth. But the point which naturally first claims our attention, is the value of this new process in relation to the supply of gas from central stations. In this connection, it offers several interesting considerations.

If the results quoted by Professor Lewes are supported by the further research which, I am glad to see, is promised, it will be necessary to modify, if not to entirely remodel, the existing theory as to the production of luminosity by the combustion of hydrocarbon gases. The "carbon density," the specific gravity of the hydrocarbons concerned, and the quantity of oxygen consumed, have all been said to affect the quantity of light yielded; while as to the temperature of the flame, the higher the better. We have been told that an earthenware burner tip is better than a metallic one, because it does not conduct away so much heat from the base of the flame; and that the application of hot air in the regenerative burner increases the luminosity by raising the temperature, or, in other words, preventing the cooling of the flame. Any given quantity of carbon in the form of ethylene gives a much better lighting value than if it existed as methane; and this was explained by reference to the respective vapour densities.

But Professor Lewes shows us a gas having the same carbon density as ethylene, a lower specific gravity, a smaller oxygen consumption, possibly a lower flame temperature, than any of the luminous hydrocarbons (with the exception of methane); and he claims for it a very high illuminating value—placing it, in fact, at the head of the gaseous illuminants. It will be interesing to extend the table of comparative illuminating values quoted by him (*ante*, p. 169), so as to show the properties of the respective gases. An examination of this, according to the light of acknowledged theory, fails to indicate any reason why acetylene should be so far superior to the others.

—	Photometrical Value.	Percentage of Carbon.	Volumes of Oxygen required by One Volume.	Specific Gravity.	Proportion of Hydrogen Equivalent to Carbon Equivalent.
	(1)	(2)	(3)	(4)	(5)
Methane (CH_4) . .	5·2	75·0	2·0	0·553	4·0
Ethane (C_2H_6) . .	35·7	80·0	3·5	1·037	3·0
Propane (C_3H_8) . .	56·7	81·8	5·0	1·522	2·66
Ethylene (C_2H_4) . .	70·0	85·7	3·0	0·968	2·0
Butylene (C_4H_8) . .	123·0	85·7	6·0	1·936	2·0
Acetylene (C_2H_2). .	240·0	92·3	2·5	0·910	1·0

Comparing the specific gravities, it will be seen that equal *weights* of ethane and propane and of ethylene and butylene respectively, yield something approaching equal photometrical values. The futility of placing any faith in carbon density is shown by comparing ethane, ethylene, and acetylene, all of which are equal in this respect. Columns 2 and 5 show a gradually increasing proportion of carbon, and a gradual diminution in the proportion between the hydrogen and carbon equivalents.

But it should be remarked that acetylene has been tested under specially favourable conditions as compared with the other hydrocarbons. Referring again to the table on p. 169, it will be found that the first four items (which, by the way, are reproduced from my work on "The Chemistry of Illuminating Gas," p. 91) refer to experiments conducted several years ago, at a time when our knowledge as to the best way of burning rich gases was very meagre. Such gases had never been used in practice; the regenerative and incandescent systems of combustion were in their infancy; and Sugg's "London" Argand burner was the "king of the castle" in regard to all questions of illuminating value. But since that period great strides have been made. The advancement of oil gas, compressed and otherwise, has led to the manufacture of special burners; so that it is now as easy to suit 80 or 90 candle gas as 16 or 20 candle gas with the appropriate means of consuming it. The value of ethylene, for example, was ascertained by burning it in an ordinary standard Argand. If these gases were placed on the same footing as acetylene, and consumed in small flat-flame burners, there is every reason to believe that the results would be higher, and therefore that the advantage claimed for acetylene would not be so great.

The photometrical value of these rich gases, however, is not so important as the enriching value; and the evidence on this

point is somewhat unfortunate for acetylene. It is admitted to be of no use as an enricher of water gas, which shows that either carbonic oxide or hydrogen is not a suitable diluent, or perhaps both. When applied in such small proportions as are likely to be used in actual practice, the enriching value appears to be much less than the photometrical value. With other gases, the enrichment value is found to be greater. Dr. Percy Frankland obtained an enrichment value for ethylene of some 20 per cent. more than the ascertained photometrical value; and some of the oil gases have been claimed to show a gain of 50 per cent. in this respect. This matter has usually been explained by the assumption that the burner used for consuming the gas in the pure form was not capable of doing full justice to the photometrical value of the gas.

Some further information as to the effect of diluents upon acetylene is furnished by Professor Lewes, who asserts that "all the hydrocarbons in a luminous flame are converted into acetylene before any luminosity is produced;" and farther on he gives the production of carbonic acid from London gas as one-fourth of that which would be evolved by the combustion of a similar bulk of acetylene. From this it appears that the London gas should yield something more than one-fifth of its bulk of acetylene, after a liberal allowance for carbonic oxide. So that the acetylene formed by the combustion of London gas, if it could be separated and used "neat," would be sufficient to yield a light of 48 candles, or threefold that actually afforded by the gas. This at once suggests the question whether acetylene is concerned in any way in the improved results afforded by regenerative and incandescent burners, which have always appeared to me to be very remarkable. The general idea of "improvement" runs in the direction of 10 or 20 per cent. When the available duty increases from threefold to fivefold, an entire change of conditions is implied.

These considerations are sufficient to show that the lecture by Professor Lewes is an important contribution to the theory of luminous combustion. I reserve for a future occasion a few remarks on the practical aspect of the question.

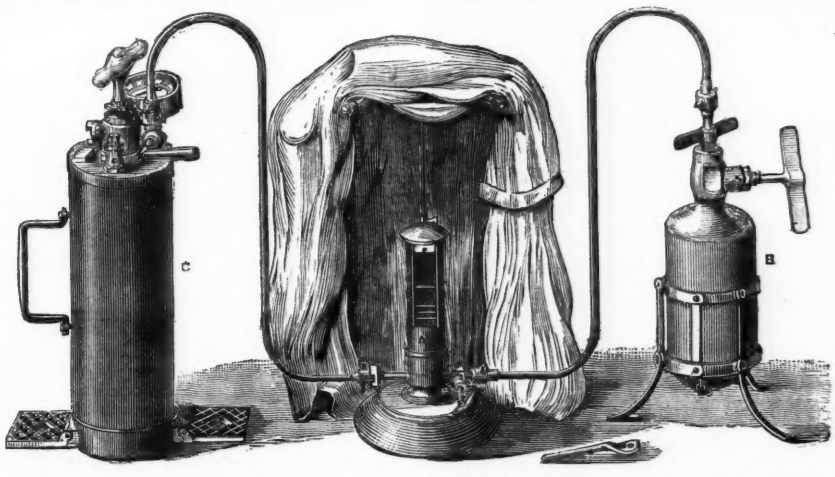
TECHNICAL RECORD.

DETECTION OF INFLAMMABLE GAS IN ELECTRIC CULVERTS.

A conspicuous feature of the recent Board of Trade inquiries into the circumstances attending the explosions which have taken place in electric lighting boxes and culverts in London has been the contradictory statements regarding the presence of coal gas therein, and its participation in the explosions. This no doubt is in a large measure due to the fact that the methods and appliances which have hitherto been employed for detecting the existence of gas in such situations have not altogether fulfilled their purpose; and, while it is not admitted that gas has been responsible in all cases for the explosions, their constant repetition points to the need for accurate and delicate testing for inflammable gas in the channels containing electric lighting wires. In a letter which appeared in our issue for the 22nd ult., Dr. Frank Clowes called attention to the application of Mr. Boverton Redwood's hydrogen testing apparatus to this particular purpose; and he testified to its reliability as a detector of gas in confined and inaccessible places. It has since been suggested that a description of this useful apparatus would be interesting to gas engineers; and, by the courtesy of Mr. Boverton Redwood and the makers (Messrs. W. J. Fraser and Co., of Commercial Road East), we are able to present to our readers an illustration of the apparatus complete, with some particulars concerning its construction and use.

When originally devised by Mr. Boverton Redwood, the apparatus was intended for the detection of inflammable vapour in the tanks of ships engaged in the transport of petroleum; and it has been used for this purpose with great success. Recognizing the defectiveness of the methods previously employed in this work (in which he is largely interested), he directed his attention to the form of hydrogen lamp which Dr. Clowes had invented for testing the atmosphere in coal mines, and which has done very excellent service. In consultation with that gentleman, and with the assistance of Messrs. Fraser and Co., Mr. Redwood produced the apparatus shown by the engraving, in which A represents the lamp, B a reservoir of compressed hydrogen, and C the sampling or collecting vessel. As here indicated, the lamp is supplied with hydrogen from B, through a connecting tube, which is fitted with a regulating-valve; and the sample of the atmosphere to be tested is conveyed through the tube connecting the collecting vessel with the lamp. The bore of this latter tube is greatly contracted; and, immediately above the point at which it enters the base of the lamp, there is an arrangement of baffles, surmounted by three discs of wire gauze of at least 28 wires to the lineal inch, or not less than 784 openings per square inch—the flow of the gaseous mixture to the flame being thus regulated, and the passage of flame into the collecting vessel being prevented. The chimney of the lamp is partly of metal and partly of glass. The metallic portion is blackened inside; and on the glass in front, lines corresponding with various heights of flame caps are marked, as shown. The top of the hydrogen jet tube inside is 0·4 inch below the bottom of the glass. Attached to the base of the lamp is a telescopic support for a cloth, which envelops the head of the observer, and excludes light when the testing apparatus is used in an undarkened room. With reference to the collecting vessel C, it is constructed with a compression-pump, which is furnished with a metallic spring piston, fitting the pump cylinder without the use of leather or other material. Surrounding the pump is an annular space, in which the sample of atmosphere is stored. On the top of the vessel, a collar is provided, to which is attached a flexible suction-tube, which may be of any length, according to the position of the culvert or other place from which a sample is required. The copper tube conveying the sample to the test-lamp is connected to a cock fitted on the opposite side of the vessel, and the bore of which is very much reduced. As will be noticed, a pressure-gauge is fixed at the top; and at the bottom there are hinged brackets on which the feet of the operator are placed while the pump is being worked. The capacity of the pump is 14·84 cubic inches, and of the annular storage space 169·14 cubic inches—thirty double strokes of the pump being required to charge the vessel to a pressure of 30 lbs. per square inch, when it will contain ⅛ cubic foot of the atmosphere sampled. As to the hydrogen cylinder, this may be of any desired size; but Mr. Boverton Redwood has found that what is known as a 5-feet cylinder is of convenient dimensions. When charged to the usual pressure of 120 atmospheres, it holds enough gas to supply a 10-mm. flame for ten hours, and is quite portable.

In the use of the apparatus, the first step is to connect the hydrogen cylinder with the lamp, taking care that the unions are screwed up gas-tight. The sliding chimney for the lamp being raised half way, the gas is turned on at the cylinder (the regulating-valve on the lamp being left open); and a light is applied to the hydrogen jet. The valve on the hydrogen cylinder is then adjusted, so as to give a flame rather more than 0·4 inch in length; and the chimney is pushed down until there is an opening only about a quarter of an inch in height at the bottom. This aperture is left for the supply of air to the hydrogen flame during the few minutes occupied in the warming of the chimney. As soon as the moisture which at first condenses upon the cold glass has evaporated, the lamp is ready for use. Assuming the collecting vessel to have been already charged with the sample to be tested, and connected with the lamp, all that remains is for the observer to completely close the sliding chimney, and adjust the hydrogen flame by means of the regulating-valve on the lamp, so that the tip of the flame is only just hidden when the eye is on a level with the



bottom of the window. The tap of the collecting vessel is then turned on; and the sample to be tested is gradually delivered to the lamp during a period of more than two minutes, which is ample for noting the effect. In this way, Mr. Redwood states, a proportion of gas or vapour, considerably below that which is required even for the production of an explosive mixture, and still lower than that which is needed to give an inflammable atmosphere, may be detected by the formation of a flame cap of greyish-blue colour, which, though faint, is nevertheless easily seen, especially after a little practice. With an increase in the quantity of gas or vapour, the flame cap first becomes much better defined, though it is not greatly augmented in size, and then considerable enlargement of the cap occurs; this condition being arrived at before the atmosphere becomes inflammable.

The following figures indicate the delicacy of the test:—

Percentage of Coal Gas in the Atmosphere.	Height of Flame Cap.
0·5	0·7 inch.
1·0	1·0 ,,
2·0	1·6 ,,
3·0	2·4 inches.

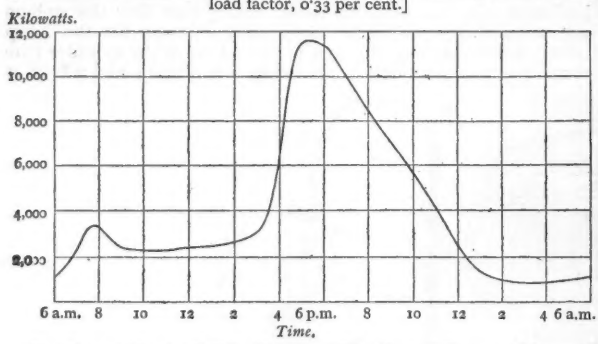
It will be obvious that this apparatus will be of immense value for the purpose of testing electric culverts, as a man may be sent into a district with several of the collecting vessels in a truck, and take samples from various points. It should also be found useful in gas-works, especially where water gas is manufactured, as it furnishes an equally sensitive test for this gas.

MR. CROMPTON'S LOAD CURVE.

In the notice of the Inaugural Address of Mr. R. E. Crompton to the Institution of Electrical Engineers, which appeared in our "Electric Lighting Memoranda" on the 15th ult., we referred specially to the portion of the address in which Mr. Crompton dealt with the question of the load factor in central station working. In doing so, he called the attention of his audience to a diagram hanging upon the wall behind him, which had been prepared, from data supplied by the Engineers in charge, to show the combined output of the London electric supply stations for a night in December last, taken simultaneously for the purpose of the address. Mr. Crompton explained that he had not had the opportunity of comparing it with the load of any other city in the world; but he said he fully believed it would be found to be one of the largest ever drawn out. The diagram was given in the *Electrician* for the 25th ult.; and by the courtesy of our contemporary, we are able to reproduce it below:—

Load Curve showing the Combined Output of the London Central Stations during the 24 hours ending 6 a.m. on Dec. 20, 1894.

[Maximum load 5.30 p.m., 11,600 k.w.; minimum load 4 p.m., 800 k.w.; load factor, 0·33 per cent.]



On the subject of this diagram, Mr. Denny Lane addressed the following letter to the Editor of the *Electrician*:—

Sir,—The diagram of the combined output of the electric light companies of London, as given in Mr. Crompton's address is, of course, very interesting; but it may mislead some persons to whom the following considerations may not occur.

First.—As the bulk of this supply goes to the west end of London, where clubs, theatres, taverns, and other places of entertainment keep very late hours, the load factor is more favourable than it would be even in other parts of the Metropolis.

Second.—The people of London in general keep later hours than the inhabitants of provincial cities and towns.

Third.—The day selected, being the shortest in the year, shows a load factor the most favourable out of the whole 365—supposing, of course, that no special consumption arises from fog. It would be desirable also to know what was the total delivery on the day in question. Of course, it may be calculated from the diagram; but the small scale of this may lead to error.

I would therefore ask Mr. Crompton if he would favour us with similar diagrams for March 22, June 22, and Sept. 22. I am sure Mr. Crompton, or some other electrical engineer, can furnish you with similar diagrams for provincial central stations.

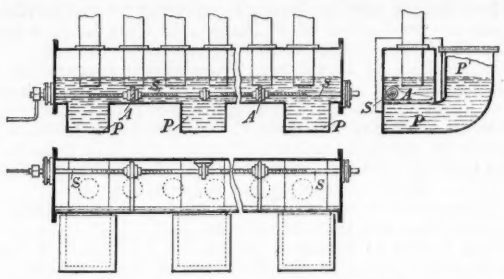
If they are of sufficient interest, I will be happy to send you corresponding diagrams of gas consumption in this city. It will show what the public demand for light is under normal circumstances, as we are scarcely ever troubled with serious fogs in the south of Ireland.

Cork, Jan. 26, 1895. DENNY LANE.

REGISTER OF PATENTS.

Hydraulic Main Cleaner.—Carpenter, Samuel, of Bow Common, E. No. 17,657; Oct. 4, 1892.

The object of this invention is "to remove the thick tar or other sediment from the bottom of the hydraulic main whilst it is in action, and to obviate the necessity of stopping gas making, opening the main, and drawing off the tar when it is required to clean the main, as is usually done." It consists essentially in the combination with the hydraulic main of deposit boxes or pockets, fixed in open connection with the bottom thereof, and carried up independently of it above the level of the contained liquor. Suitable scrapers extend transversely across the main at or about its base, adapted to be travelled to or fro in the main between the pockets by means of a rotary screwed spindle, so as to scrape off the deposit, and carry it to an adjacent pocket, whence it can be removed by scoops or the like when required during, and without interfering with the continuity of, the process of gas manufacture.



As shown in the engraving, the cleaning apparatus consists of a longitudinal shaft S, arranged at a suitable level in, and running the entire length of, the main. It works through stuffing-boxes in the end flanges of the hydraulic main; and to prevent deflection, it may be supported where necessary by intermediate bearings attached to the inside of the main. The shaft may be screwed for the whole of its length, or according to the number of "deposit pockets" to be hereafter described. It is illustrated as screwed at intervals; and upon each screwed length is mounted a threaded boss carrying a plate or scraper A, so that, on the revolution of the shaft, the scraper will accordingly travel forward or backward along it. Beneath the feet of the dip-pipes and the top of the scraper, a considerable clearance is left; and the shaft is preferably arranged at one side of the main only, so as to avoid the dip-pipes. There is a cranked handle for revolving the shaft, or any convenient power may be substituted. The scrapers extend practically across the base of the main transversely; only the necessary clearance being left at the free ends. They may be supported by, and travel on, bars fixed longitudinally at the bottom of the main, so as to keep them practically horizontal at all times.

P are the deposit pockets, arranged at suitable intervals, and in open connection with the bottom of the main. Each pocket extends transversely below the hydraulic main, and is continued up the side to about the same level as the top of the main. But the rising part P^1 is separate from the main; and thus the level of the contents of the main and the pocket is the same. Removable plates cover the open tops of the pockets P.

To clear the main, the scrapers are travelled to and fro, so as to scrape off all deposits, and carry them into the pockets. Then, by removing the plates, the collected deposits can be removed through P^1, without interfering with the seal of the dip-pipes or the continuity of the manufacture of gas.

Utilizing the Exhaust Heat from Gas, Oil, Tar, or Spirit Engines.—Fidler, E., of Liverpool. No. 2540; Feb. 6, 1894.

This "invention" has for its object (in the words of the patentee) "the application and utilization of the heat arising from the explosions or decomposition by ignition of the hydrocarbon or carburetted hydrogen gases, or the gases or vapour produced from tar, oil, or spirit, and the application of the heat or exhaust heat, or the heated products of combustion from oil or gas engines as aforesaid, either for the evaporation of liquids or for heating purposes by direct or indirect application."

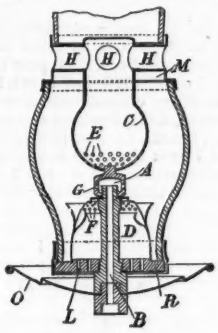
The application of this waste or exhaust heat to every form of heating or evaporating may be so general that explanatory drawings are considered unnecessary by the patentee. Still he gives a few examples (by way of explanation only) thus: "1. Its direct or indirect application to every form of boiler or evaporator, by directing the gases or exhaust into, around, over, or through the evaporators and liquids therein. 2. Or over, under, or into, salt pans, caustic pots, and the like. 3. Or around, into, or in any other manner for the heating of any substance or receptacles to which heat can now be applied."

Regenerative Gas-Burners.—Haeussler, J., of Berlin. No. 21,628 Nov. 9, 1894.

In carrying his invention into practice, the patentee arranges below the burner a hollow conoidal chamber, from the apex of which the burner extends upwardly. The chamber is provided with perforations around the burner, through which the air passes; and above the burner (concentric to it) is a second air chamber of a partially spherical form, having perforations at its lower part around the burner and communicating with the outer air. This upper chamber is heated by the flame of the lamp when burning; and the air passing to the burner through it will be consequently heated to a very high degree, causing the lamp to burn with an intense white flame."

As shown in the engraving, gas is conducted to the burner A through the pipe B leading from underneath the base plate R of the lamp. Around the burner, and concentric with it, is a chamber D, having perforations F at the upper part. This chamber communicates with the outer air through perforations L in the base plate. The burner is

provided with horizontal circularly arranged perforations G, so that the gas will issue horizontally, and burn in the form of a circular flame, having its outward edges curling upwardly. Above the burner, and also concentric thereto, is the upper heating chamber C, centred on the burner by a pin, and provided at its upper end with air-inlet



passages H, having their outer ends fixed in a ring M forming the upper closure to the glass globe of the lamp. The chamber is partially spherical in form; and its lower part is provided with perforations E, which admit the air to the flame. The upper part of the ring M is adapted to carry the chimney of the lamp.

When in operation, the flame, which continually plays around the upper chamber C, will heat it, and consequently the air passing through the chamber. But, in order to prevent outer air currents and draught from influencing the burner, a saucer or plate O is provided underneath the base plate, on which the exterior lamp globe may rest.

Of particular importance in the present invention (says the patentee) is the arrangement of the air-inlet holes in the air chambers C and D, whereby the air is distributed equally over the whole surface of the flame.

Gas, Oil, or Vapour Burners for Heating Purposes, and Heating Stoves or Ranges Employed Therewith.—Fennessy, F. R., of New York City. No. 23,552; Dec. 4, 1894.

This invention, relating to gas, oil, or vapour burners adapted for heating purposes, embraces certain novel features in heating-stoves, the burners therefor, and many details of construction, all fully described and illustrated in six sheets of drawings, with 36 separate figures.

APPLICATIONS FOR LETTERS PATENT.

1377.—Gill, R. E., "Regulating the supply of gas to railway-coach compartments." Jan. 21.

1408.—Bergmann, T., "Reflecting gas-stove." Jan. 21.

1487.—Glasgow, A. G., "Manufacture of water gas." Jan. 22.

1552.—Smith, B. G., "Connecting or joining metal pipes." Jan. 23.

1559.—Holgate, C. H., "Valves for steam, applicable also for water, gas, and similar purposes." Jan. 23.

1577.—Taylor, A. and W. S., "Burners and mantles for incandescence gas lighting." Jan. 23.

1604.—Heusler, F., "Purification and desulphurization of tar oils and petroleum for the production of pure burning and lubricating oils therefrom." Jan. 23.

1616.—Tennant, P. C., and Hall, J. E., "Carburetting and enriching coal and other gas." Jan. 23.

1649.—Crane, H., jun., "Gas-engine ignition by electricity." Jan. 24.

1658.—Iredale, J. H., and Gerard, E., "Lamps." Jan. 23.

1707.—Dunn, J. H., and Parsons, J., "Electric water gas." Jan. 24.

1802.—Pullen, J. H., and Scott, W., "Compensating variations or irregularities in the speed of gas or other engines." Jan. 25.

1803.—Beechey, C. G., "Gas-meters." Jan. 25.

1807.—Gearing, E., "Furnaces for producing carbide of calcium and the like." Jan. 25.

1847.—Yeadon, A. E., and Richardson, J., "Briquettes or blocks of compressed fuel." Jan. 26.

1849.—Mercer, E., jun., and Mercer, C., "Gas and oil engines." Jan. 26.

1857.—Fletcher, T., Russell, W., and Fletcher, Russell, and Co., Limited, "Air-blast gas-burners." Jan. 26.

1876.—Biermann, J., "Water-meter." Jan. 26.

1884.—Serret, F. L., "Diminishing the noise of gases escaping from the exhaust of gas-engines and the like." Jan. 26.

1904.—Lake, H. H., "Lighting devices for gas lamps, stoves, and the like." A communication from W. Ritter. Jan. 26.

Colne Valley Water Company.—In the report which the Directors of this Company will present at the half-yearly general meeting on the 12th inst., they state that the profit on the working of the undertaking in the six months ending Dec. 31 last was £4572. Out of this sum, £3115 will be available for division; and the Directors recommend a dividend at the rate of 4 per cent. per annum, less income-tax. This will leave £314 to be carried forward. The Directors mention that the Central Middlesex Water Bill received the Royal Assent on the 17th of August last; and that the transfer of the Sudbury and Alperton district has since been completed—the supply to the new area having been commenced at Michaelmas last. In September, £10,000 of additional capital was raised to provide the purchase-money payable to the Central Middlesex Water Company; and though the shares were offered to the existing shareholders only, and at £1 per share premium, the applications amounted to nearly seven times the sum required. The total expenditure on capital account in the six months covered by the report was £13,164, including the above-mentioned purchase-money and other expenses connected with the new district.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Comparative Cost of Light from Different Sources.

Sir,—Mr. T. P. Travers has called my attention to the figures given in Mr. Frank Wright's table of cost of electric and gas lighting, as published in the Journal for Jan. 22 (p. 177); and I must say they surprise me very much.

As an example, I will refer to the cost per 1000 candles for incandescent electric lighting, which he estimates as 1·19d.; and he gives the usual allowance made by electricians of 4 watts per candle. This is probably true when the lamps are quite new, but is a large underestimate as they grow older. As it takes, on Mr. Wright's own showing, 4 watts to produce 1 candle, it must therefore take 4000 watts, or 4 units, to give 1000 candles. The usual price per unit is 8d.; so that the 1000 candles would cost 32d., instead of the 1⅛d. of Mr. Wright's estimate. As the ratio of 1·19d. to 32 is as 1 : 27, Mr. Wright must have introduced an occult divisor of 27 into his calculations.

Mr. Wright alleges that his figures *re* electricity are formed on his own observations. If this be the case, he must have been able to supply each unit for 1·19 ÷ 4 = 0·39d. per unit. If he can do this, he must possess a secret process unknown to the electrical engineers. The cost per unit delivered to consumers is, according to the latest returns given in *Lightning* of the 10th inst., as follows:—

Charing Cross	2·93d.
Chelsea	4·32
Kensington	3·45
Notting Hill	5·29
St. James's	3·68
St. Pancras	3·55
Westminster	3·44
City of London	2·83
House-to-House	5·15
Metropolitan	5·99
London Electric	6·25

46·88d. ÷ 11 = 4·26d. average.

The average 4·26d. is thus 11 times more than the cost at which Mr. Wright, "from his own particular experiences," can produce and distribute electricity. I repeat the word *distribute;* for Mr. Wright, in estimating the total cost of London gas at 1s. 6d. per 1000 cubic feet, must include this and all other charges. The selling price of gas we may take at 2s. 7d. Deducting for dividend 11·51d., and for interest on loans 1·59d.—making together 13·10d.—there remains 18d. per 1000 feet for the total cost of production, distribution, salaries, directors, collection, rates and taxes, and all other charges of every kind.

Surely, if Mr. Wright can produce, and distribute the electric current for less than one-tenth of what it costs the companies at present, there lies within his reach "a potentiality of wealth beyond the dreams of avarice." But until there is some authority other than his own for thus decimating the cost, I remain unappalled by his calculations.

I may be allowed to point out a small error in Mr. Wright's calculations, when he says that the cost of light by acetylene is 1·81d. per 1000 candles. The price of acetylene being 6s. 4½d. per 1000 cubic feet, giving 48 candles per foot, the cost would, "according to Cocker," be only 1·59d., not 1·81d. This error of 14 per cent. "pales its ineffectual fires" before the brilliant figures to which I have called attention above, and may have arisen from the haste with which the writer rushed into a controversy in which he must have overlooked some most important elements of cost.

Cork, Jan. 28, 1895. Denny Lane.

Sir,—I have read with great interest the many letters and articles which have appeared in your columns on the subject of Professor Lewes's masterly lecture on the production and properties of acetylene and its possible future as an illuminant; but I do not think that what has yet been said has thrown any real light on a point which, while it is of the utmost interest, was only lightly treated by the lecturer. I allude to the question whether, taking £3 10s. as the cost of production of a ton of calcic carbide, it will be more profitable to spend this sum in generating electric energy, to be used directly in incandescent lamps, or to apply it to the manufacture of carbide, and burn the resulting acetylene.

In a letter in your issue of the 22nd ult., your correspondent, Mr. Frank Wright, severely attacks some figures quoted by Professor Lewes. But the data upon which he bases his own calculations are, in my opinion, inconsistent with practical experience; and he has, I think, rather obscured the matter than elucidated it.

The answer to the question depends, of course, mainly upon the cost at which electrical horse power can be produced. In the table supplied by Mr. Wright, he assumes that 180 × 12 electrical horse-power hours can be supplied for 35s. This amounts to a little less than ⅛d. per electrical horse-power hour—an estimate too low, I submit, to be realized in practice, except in cases where the output is very large, and the load continuous and uniform.

For the purposes of electric lighting, where the load is necessarily extremely variable, the cost of electrical horse power averages, even with the best installations, at least 2d. per unit, or 1½d. per horse-power hour; the price at which it is retailed to consumers rarely being less than 4d. per unit, or 3d. per horse-power hour. I submit, therefore, that the following solution of the question is a more practical one than that afforded by your correspondent:—

£3 10s. expended on 1 ton of calcic carbide will give 11,000 cubic feet of acetylene, affording, at 48 candle-hours per cubic foot	528,000 candle-hours.
£3 10s. expended on electrical horse power at 2d. per unit will give, at 4 watts per candle power	105,000 candle-hours.

Showing a greater economy in favour of the acetylene of about 5 : 1. To this I may add—

£3 10s. expended on the manufacture of London gas at 1s. 6d. per 1000 cubic feet will give, with Welsbach mantles, at 12 candles per cubic foot	560,000 candle-hours.

Later on in his letter, Mr. Frank Wright compares the relative

economies of electric energy and acetylene, as sources of illumination, in a more remarkable way. He debits the electric lighting with the cost of the fuel only, and at the low rate of 2 lbs. of coke, at 10s. per ton, for each electrical horse-power hour. Surely this cannot be meant to be taken seriously, for, even if any practical installation could show so high a duty, which I venture to doubt, the other working charges would certainly raise the total cost of the electrical horse-power developed to double or treble the cost of the fuel only. Moreover, while giving the electric lighting the advantage of this abnormally cheap electric energy, he omits to credit the cost of the acetylene with a similar cheapening of the electricity by which the calcic carbide is produced. The result he thus arrives at, showing an advantage for electric lighting over the acetylene in the ratio of 121 : 44, is therefore fallacious.

The ratio quoted by Professor Lewes—viz., 28 : 44—represented, as I understood, the relative light-producing value of an amount of electric energy directly employed in incandescent lamps, and the same amount of *electric energy* put into calcic carbide (*not* the same total amount of *money expended*). This ratio appears to me to be substantially correct, for it works out thus: 180 electrical horse power for 12 hours would give, at 4 watts per candle power, $\frac{1}{4}$ (180 × 12 × 746) or 40,284 candle-hours, while the same amount of electrical energy put into a ton of carbide would give 11,000 cubic feet of acetylene, affording 11,000 × 48 or 528,000 candle-hours; and the ratio of these two numbers is about 3 : 4, or not far from 28 : 44 as quoted by Professor Lewes. I imagine, however, that Professor Lewes regarded these figures rather as of theoretical interest than of practical significance, for the cost of the electrical energy is, of course, not the whole cost of the manufacture of the carbide.

On the question whether a ton of calcic carbide can, or cannot, be produced commercially for £3 10s., as estimated from the American experiences, I do not venture to pass an opinion. I should have grave doubts about it were it not for the assurance given by Professor Lewes that the manufacture has lately been further cheapened by the use of alternating currents in the electric furnace. An electrical horse power certainly cannot be produced at the price quoted (about ½d. per hour) except at those rare places where cheap water power is available.

Apart, however, from the question of commercial advantage, it at least appears to be an interesting fact that a given quantity of electric energy can be made to give more light if applied to the manufacture of acetylene than if it be transformed directly in incandescent lamps.

CARLTON J. LAMBERT.

Royal Naval College, Greenwich, Feb. 2, 1895.

The Manufacture of Carbide of Calcium.

SIR,—It may interest your readers (most of whom are at present concerned in the production of acetylene gas for enrichment purposes), to learn that I have undertaken experimentally the production of calcic carbide, and find the same to be readily made with an electric current of 70 ampères, using a mixture of lime and coke in a small crucible.

The action of calcic carbide in the production of gas, is analogous to "swelting" stone lime with water, and making cream of lime, and liberating steam and other gases. The two are identical in their application. To illustrate the lighting properties of the acetylene gas given off from the swelted calcic carbide, I placed a piece on a dish and covered it with a glass funnel; and, on application of water, violent effervescence takes place, and the liberated gas issues from the end of the stem. This, when lighted, burns with a very bright flame.

Its cost of production and behaviour as an enricher to "lean" gas are matters that require investigation, though the chief item of cost will be the electrical energy. So far as my experiment goes, the manufacture is very simple; and the use of a suitable large dynamo for a few days would settle the point. The subject is one which might be undertaken by some gas company in the vicinity of a large dynamo works, for mutual interest of the two industries.

WM. CHEW, M.I.E.E.

Gas-Works, Blackpool, Feb. 1, 1895.

Gas Lighting with Acetylene.

A correspondent has forwarded to us the following translation of a letter, under the above heading, which appeared in the *Chemiker Zeitung* for the 30th ult., and which no doubt will be perused with interest by our readers:—

It is impossible that one kilogramme of calcic carbide ($Ca C_2$) can yield 3·6 cubic metres of acetylene. The theoretical obtainable quantity is 0·406 kilo = 0·350 cubic metre. As to the cost of calcic carbide, it is stated that it is 80s. per ton. This seems to me rather optimistic. According to Yoissan, the inventor of calcic carbide, a current of 350 ampères and 70 volts gave, in from 15 to 20 minutes, 120 to 150 grammes of calcic carbide. To produce this current, $\frac{350 \times 70}{670} = 36{\cdot}5$ horse power are necessary, which, with a great and economic installation of steam power, would cost at least 5 × 36·5 = 1·82s. If such a current produces in 15 minutes 150 grammes, or 600 grammes per hour of calcic carbide, the cost of the current alone would be 3s. per kilogramme of calcic carbide. A kilogramme of acetylene would therefore cost more than 7s. 4d.; and a cubic metre of acetylene, 8s. 6d. As, according to observations made up to now, the illuminating power of acetylene may be considered the same as that of benzol for the same weight and under like conditions, and as benzol only costs 3d. per kilogramme, it follows that acetylene, viewed either as an enricher of ordinary gas or as an illuminating gas by itself, is at present about thirty times as expensive as benzol, and will therefore not come into competition until the cost price of calcium carbide can be very considerably reduced.

DR. RAN.

Zabize, Jan. 24, 1895.

Mr. R. Forbes Carpenter on the Enrichment of Coal Gas.

SIR,—I do not know that the letters of Mr. Young and Mr. Gresty, in your issues for Jan. 22 and 29, representing the special merits of the Peebles and the oxy-oil processes respectively, call for extended reply from me. Each in his letter admits my description of the drawbacks that attend enrichment processes to be true, at any rate of some processes in the market; each, as is very natural, is at pains to show that the process in which he is interested is, by its very peculiarities, exempt from these drawbacks. "Let the galled jade wince; our withers are unwrung."

I thank Mr. Young for his kindly remarks; and I would ask both gentlemen to be good enough to bear in mind the circumstance that, in my address as Chairman of the Manchester Section of the Society of Chemical Industry, I could allot but a brief portion of it to each particular subject, as so many claimed attention. I feel that I should be doing injustice to others, did I dwell on the peculiarities of any one particular process; and, thanks to Mr. Herring's courtesy, it is with the oxy-oil process that I have the most acquaintance. If I have done anyone an injustice, I sincerely regret it; but I felt that your readers have not suffered by having their attention called to enrichment processes by the interesting letters in your last two numbers. Mr. Young's remark on size of flame in relation to carbon and hydrogen densities were of special interest to me. I was not unaware of the points he raises, but had no time to devote to this section of the subject. They have renewed interest in regard to the possible commercial future of acetylene.

With respect to stratification, I had in my mind some remarks made by Professor Vivian B. Lewes, in a discussion, previous to May, 1894, on the oxy-oil process, when he stated that, in his photometric tests of enrichment results—not specially of oxy-oil gas—he found himself obliged to burn his holder through, taking tests at stated intervals, and average the figures obtained, to obtain anything like reasonable and concordant results. Is it not reasonable to argue that the same conditions prevail in the large holder as in the small one?

R. FORBES CARPENTER.

Manchester, Jan. 31, 1895.

New Water-Works for Rugeley.—The new water-works which have been constructed for the supply of Rugeley were formally opened last Wednesday; the occasion being regarded as a public holiday. The water has actually been in use for a month or two; but the District Council determined to give prominence to what they consider the success of their project, which is estimated to cost about £6000—a loan having been sanctioned for 30 years for £6472 by the Local Government Board. The water is obtained from a site near the old Fair Oak Colliery by means of boreholes; and it flows thence into a brick reservoir, and so on by gravitation to Rugeley and Brereton, supplying a population of about 6000.

Sales of Shares and Stock.—At a local sale yesterday week, 30 £10 fully-paid shares in the *Redcar and Coatham Gas Company* were sold at £17 each. The highest dividend recently paid on this class of shares is 8 per cent.——At Accrington on the same day, some 5 per cent. debenture stock in the *Accrington District Gas and Water Company* sold at 33⅜ years' purchase, and an annuity in the same concern, redeemable at 35 years' purchase, fetched 36 years' purchase. The Joint Gas and Water Board was created last year; and this, it was stated, was the first public transaction in this stock.——At a sale by auction at Lincoln last Tuesday, some fully-paid £10 7 per cent. shares in the *Boston Gas Company* realized £17 10s. each.

The Forthcoming Exhibition in Bordeaux.—In the JOURNAL for the 8th ult., we gave some particulars as to the exhibition which is to be held in Bordeaux, by the Philomathic Society of that city, from May to November this year, in connection with which it is intended to erect a special pavilion to contain gas appliances. The limit of time for sending in applications for space was the 31st ult.; but it has been extended to the 28th inst. Those of our readers who contemplate exhibiting, or who take an interest in the project, need not apply to the Society direct for any information they require, as a Publicity Committee has been nominated by the London Chamber of Commerce for the purpose of furnishing it; and the Secretary may be addressed at the offices of the Chamber, Botolph Lane, E.C.

Halifax Corporation Water Department.—The summary of the work done in the Water Department of the Halifax Corporation during the year 1894 includes the following: Length of new mains, 7167 yards. New houses and shops supplied, 351; warehouses, 3; meters fixed for trade, 78; and miscellaneous, 245. Houses, mills, workshops, &c., visited by the inspectors of fittings, 39,415; and the following number of fittings were found defective: Taps 9949, water-closets 258, and burst pipes 653. Complaints taken in the office of all descriptions, 11,978. The water was turned off 1372 times for repairs of various kinds for authorized plumbers. The hydrants inspected and the mains washed out numbered 5268—5161 being found in good order, and 107 defective. The above is exclusive of any contracts, and the work of laying service-pipes and private mains, and repairs at the various reservoirs.

Fatal Accident to an Employee of the Manchester Corporation Water Department.—A singular fatality to a workman in the employ of the Manchester Corporation Water Department was investigated by the City Coroner (Mr. Smelt) on Monday last week. The deceased was Robert Curry, a labourer. On the previous Thursday, he, along with three other men, was engaged laying a water-main through an entry between Temple Street and Barlow Street, Chorlton-on-Medlock. The passage, which was flagged, was about 3 ft. 6 in. wide, and, to allow of the pipes being laid, flags to the width of 18 inches were removed, and a cutting 1 foot wide and 15 inches deep was made at the side of the entry. One length of piping was laid; and the deceased was just preparing to lay another, when one of the walls which bounded the entry on either side suddenly collapsed. Curry was buried in the ruins, and received such severe injuries that he died at the Royal Infirmary on Sunday. There had been no suspicion as to the soundness of the wall; and consequently no precautions were taken to avoid an accident. After the occurrence, it was found that the foundation of the wall was very shallow. The jury returned a verdict of "Accidental death," and recommended that in future men engaged in this work should have some assurance, or otherwise, as to the soundness of walls, and that extra precautions be taken to avoid such accidents.

PARLIAMENTARY INTELLIGENCE.

EXAMINER'S ROOM, HOUSE OF COMMONS.

Monday, Jan. 28.

(*Before Mr.* CAMPION.)

The London Water-Works Transfer Bills.

The inquiry into the allegations of non-compliance with Standing Orders in the case of the notice given by the London County Council in regard to their Bill for acquiring the undertaking of the Chelsea Water Company, the commencement of which was reported last week (p. 223), was resumed to-day.

Mr. REES (Messrs. Rees and Frere) appeared for the Water Companies; Mr. A. L. CRIPPS (Messrs. Dyson and Co.) represented the County Council.

Mr. REES said there was only one further allegation in the memorial of the debenture-holders of the Chelsea Company with which he proposed to deal; and as the first one in the Company's memorial was the same, he would take the two together. It was that clause 5 of the Bill provided that "unless an agreement should have been made under the preceding section between the Council and the Chelsea Company previously to the 31st day of March, 1896, or within any extended period which may be agreed upon between them under their respective seals, the undertaking shall, as and from that date, become and be, by virture of this Act, absolutely transferred to, and vested in, the Council (subject to any debenture stock charged thereon), on such fair and reasonable terms, having regard to all the circumstances of the case, as, failing agreement, may be determined by arbitration in manner hereinafter provided;" and that the notice did not specifically state the intention of the Council in this respect. He cited the Hoylake railway case, decided in 1872, and the North of Europe Steam Navigation Company's case, decided in 1856, in support of his contention that a mere general notice was not sufficient, and that more specific declaration was required as to the way in which the Bill was intended to operate. The question also arose last year on the Water Bill of the London County Council with regard to money powers; and the Examiner held that the method by which it was proposed to provide funds became an important object of the scheme, and that specific notice ought to have been given of this matter. He asked the Examiner to consider the importance of the scheme involved in the eight Bills deposited this year. It was first of all a scheme for the purchase and transfer to the Council of the water undertakings of London. No one would put this at a less sum (though, of course, it was a sum to be arrived at by-and-bye) than from 30 to 40 millions of money; and therefore, so far as regards money, the scheme was one of enormous magnitude. So, in respect to locality and people involved, it was a question of the supply of water not only to the whole of London, but to very large populations and districts in the adjoining counties of Middlesex, Surrey, Essex, and Kent. From this point of view, therefore, the objects of the scheme were of extreme importance.

Mr. CRIPPS remarked that Mr. Rees was, of course, aware that they were now simply dealing with one Bill—that relating to the Chelsea Company.

Mr. REES said he was quite aware of that; but Mr. Cripps could not escape in that way, because all the Bills were before the Examiner; and though the scheme was contained in eight Bills, it was one.

Mr. CRIPPS said this was a question of merits, which would be considered before the Committee.

Mr. REES admitted this. But he said that, when they were inquiring as to whether or not the notice was specific, the merits of the Bill must be considered by the Examiner; and they were considered in the case he had quoted.

The EXAMINER said that he pointed out at the last sitting that the magnitude of the objects of the Bill was a question to be discussed, and that it was impossible to keep entirely clear of the merits.

Mr. REES said the two things were quite distinct. He did not intend now to go into the merits, whether or not it was a proper scheme to be passed by Parliament; but he was calling attention to the magnitude of the scheme, both as regards the money involved and the area to be supplied, which were facts that would not be disputed. In fact, he did not suppose it was possible to conceive of Bills of higher importance, from every point of view, than those now before the Examiner. Coming to the particular allegation, which was as to the form in which the transfer of the undertaking should take place, it was of vast importance, both to the Companies and to the public, to know when the change contemplated by the Bill—the transfer of the water supply of London and the surrounding neighbourhood from the private Companies to the County Council—was to take place. Part III. of the Bill contemplated the possibility of an agreement; but Part IV. (of which clause 5 was the first) had reference to the case (which he certainly should think would happen) of no agreement being come to between the Council and the Company. In that event, on the 31st of March, 1896, the undertaking was to be absolutely transferred to the Council before the terms and conditions of the transfer were arrived at. How many years it would take to determine this question, it was difficult to foresee; but everything was to be in the future. This must strike anybody at once as putting the cart before the horse. In every case, if an estate or a house was purchased, the transfer did not take place until the terms were settled and the money paid; but the effect of this clause was to ignore that ordinary rule of life, and to begin by transferring everything to the County Council. Just consider the effect of this departure from the ordinary rule. When the Arbitrator came to settle the price, the property would be in the hands of the Council, and he must determine the price as at the date of transfer, and therefore must go back two or three years to find out the worth. It had been admitted by the other side that the undertakings were growing in value from day to day; but they would be deprived of this increasing value. He supposed that all the cases would be taken by the Arbitrator to a certain extent together. But it must be a matter which would necessarily occupy an enormous amount of time; and why should the Companies be deprived of their right to have the value of the undertakings settled as on the day when they were to receive payment for them? There was nothing in the notice to lead anyone to suppose that the transfer was to take place upon a day named in the Bill, and not in the usual manner after the terms had been agreed; and, indeed, parts of the notice were inconsistent with the idea that there was to be an immediate vesting upon terms to be afterwards settled. It was an unheard-of proceeding that they were first to deprive a man of his property, and afterwards settle what was to be paid for it. Of course, when the London County Council were promoters of the Bill, there was reasonable ground for supposing that the Companies would get their money. But if it had been promoted by individuals who might not be solvent, there would be great risk in adopting such a course; and there was no reason why the Council should be put in a different position from other people.

Mr. CRIPPS said Mr. Rees's argument proceeded upon the mistaken basis that the Bill under consideration was a purchase instead of a transfer Bill, and that the ordinary course—the same, in fact, that was followed in the case of the Edinburgh Water Bill had been taken in giving the notice. The Hoylake and North of Europe cases were not applicable as precedents, as they were not transfer Bills. He protested against the course which had been adopted by Mr. Rees, of referring to the magnitude of the objects of the Bill. He was well aware that its objects were very important; and Mr. Rees was quite entitled to the observation that there were seven other Bills also pending, each of which he was opposing. Putting all the eight Bills together, it was probably one of the largest transactions which had ever been proposed; but a proposition very like it had been made before in the case of Edinburgh, on a very similar notice. It had been too much the habit of the Water Companies, as a part of the general campaign, to have it stated that £30,000,000 to £40,000,000 was the sum to be paid for their undertakings; and nothing had so much retarded the settlement of the matter as this sort of statement. The capital of the Companies was clearly set forth in their accounts; and it was shown that what they had spent was from £12,000,000 to £15,000,000. Yet they were continually talking, in order to get it into the newspapers, of £30,000,000 or £40,000,000.

Mr. REES: It is your own figure.

Mr. CRIPPS: We quote what you say, of course.

Mr. REES: But you say £35,000,000.

Mr. CRIPPS, referring to the decision of the Examiner on the Bill of last session, contended that it dealt with an entirely different matter to that now in question; and he urged that the notice which had been given in the present case was sufficient. Referring to the part of the Bill which provided for transfer by agreement, he said that obviously, before agreeing, the Council must make themselves acquainted with the value of the undertakings. For this purpose, they asked for the inspection of the works and accounts of the Companies, which had been persistently refused, and without which they could not even make an offer.

Mr. REES, in reply, said there was no case to be found providing for transfer first and payment afterwards; and he urged that the notice should have been so specific that the public could not be deceived. It ought not even to be ambiguous, but so specific that the public should know when such a fundamental change in the conditions of water supply was to come into operation.

The EXAMINER said he considered that the notice was perfectly adequate. It intimated quite clearly and sufficiently what were the objects of the Bill, and what were the powers which were to be sought in carrying out those objects. Therefore he should not sustain the allegations.

Mr. REES said that this concluded the memorial of the debenture-holders of the Chelsea Company; and he should not appear upon the allegations of the debenture-holders of the other Companies.

After a short adjournment, the memorial of the Chelsea Company was proceeded with.

Mr. REES said the first allegation he would deal with was that the notice provided that there were to be two Arbitrators to be appointed by the Council and the Company respectively, and a third to be appointed by the Board of Trade (or in such other way as might be defined in the Bill); whereas the Bill provided that the third Arbitrator was to be chosen by the other two, and to act as Umpire if necessary. Such a notice was calculated to be misleading. The appointment of an Arbitrator by the Board of Trade might give many of the shareholders and debenture-holders an assurance that they would have a fair arbitration, and that the Board of Trade would see fair play between the Companies and the County Council. The Bill as it passed the Council provided for a Board of Trade Arbitrator; but it was not for him to suggest how its terms had been altered after it had been formally approved by the Council.

The EXAMINER said he hardly thought it necessary to call upon Mr. Cripps. The allegation was with regard to an alleged mis-description of the machinery by which the arbitration was to be carried out; but he considered that the terms of the notice were quite broad enough to cover the variations Mr. Rees had stated to exist between the notice and the Bill. He should therefore not sustain the allegation.

Mr. REES next raised the objection that the notice for the Bill did not cover the provision that the individual shareholders were to be compelled to accept consolidated stock or annuities, in lieu of cash, for their interest in the undertaking.

The EXAMINER dismissed this allegation also; stating that he thought the notice sufficient.

Mr. REES next drew attention to clause 11 of the Bill, which he also urged was not covered by the notice. It provided as follows: "Any appointment to any office or service of the Chelsea Company, and any contract with respect to any matter connected with the undertaking made by the Chelsea Company, and any grant or alteration in the rate of salary or wages payable to any officer or servant of the Chelsea Company made subsequently to the 1st day of July, 1894, shall not continue in force after the date of the transfer, unless it shall have been made with the consent in writing of the Council." He pointed out that the date was already six months past; and it was proposed to make a retro-active clause invaliding all contracts of the Company The Company could not help making these contracts. Last session,

hostilely to the Council, they obtained powers to expend £1,500,000 or £2,000,000 on new works, which were so urgently required for the purpose of enabling the Company to comply with their statutory obligations that Parliament absolutely imposed upon them the obligation to proceed at once. How were these works to be gone on with except under contract? And yet it was now proposed to invalidate the contracts, so that the contractors could not sue upon them, because the County Council, which were engaged in hostile proceedings against the Company, had not given their consent.

The EXAMINER, without calling upon Mr. Cripps, said the allegation related to the method of carrying out the transfer; and it was a natural, if not a necessary, incident of such transfer. He could not sustain the allegation.

Mr. REES said the next allegation was a similar one to that which the Examiner decided in his favour on the Bill of last year. Clause 22 of the Bill provided that "all costs and expenses of the Council in the execution of this Act (except so far as they may be provided for by this or any other Act) should be defrayed as payments for general county purposes within the meaning of the Local Government Act, 1888; and the costs, charges, and expenses preliminary to, and of, and incidental to, the preparing, applying for, and obtaining, and passing of this Act, shall be paid by the Council in like manner." He pointed out that this would throw upon the rates of one year the whole cost of acquiring the undertaking; and he called attention to the discrepancy between the terms of the notice and the clause—the former being "to provide that all costs and expenses of the Council in the execution of the powers of the intended Act," &c.

Mr. CRIPPS said there was in the notice a distinct intimation of the intention to raise money by rate; and there was also another paragraph dealing with the question of raising money by stock. The County Council were placed in the peculiar position that they could not raise money by means of a Private Bill, but must bring in a Public Money Bill, except on certain conditions, among which were that they must recite the amount in the preamble, and that they could not borrow for more than 60 years. Both of these conditions were impracticable; and the matter would therefore be dealt with in the Money Bill, unless the House of Commons, by instruction or directly, authorized the insertion of such powers in the present Bill.

Mr. REES said the Council might have named a maximum sum—say, £50,000,000—and they might borrow the money for a longer term than 60 years, with the sanction of the Local Government Board. But the Council would not submit themselves to the Local Government Board; and this was the reason why they did not choose to exercise the powers which might be put into the present Bill.

The EXAMINER said he did not attach much importance to the omission from the Bill of the three words contained in the notice. The only doubt which had arisen in his mind was whether the Council would have power, under clause 22, to throw the cost of the purchase of the undertakings upon the county fund and general rate. But it was perfectly clear to him that, if it ever was their intention to do so (and he did not think they had this intention), they would not be allowed to carry it out. He did not know if the clause would have this legal effect; but if it was ascertained, before the Committee, that it would, he had no doubt an amendment would be introduced to rectify the mistake. He should not sustain the allegation.

The discussion on the remaining Bills was postponed till the following Friday, in order to give the Companies an opportunity of deciding whether or not they would proceed with the memorials; there being only one point to be raised which had not been covered by the decisions on the Chelsea Bill.

Friday, Feb. 1.

The Water Bills were again placed upon the paper, to be dealt with by the Examiner, to-day; but it having been intimated that the memorials of the other Companies would not be proceeded with, he certified that the Standing Orders had been complied with.

Cordova Water and Irrigation Works, Limited.—A Company has been registered under this title, with a capital of £1000, in £5 shares, to supply the town of Cordova, in Spain, with water.

Gas Supply of Rio de Janeiro.—Notwithstanding the unsettled state of affairs in Brazil, during, at any rate, part of last year, the quantity of gas sold by the Rio de Janeiro Gas Company in the twelve months ending Dec. 31 last was close upon 640 million cubic feet, as compared with about 614 millions in 1893.

Explosion of Gas.—Last Saturday week, the Manager of the Donington (South Lincs.) Gas-Works, while examining some school premises, placed a lighted match over a grating, where he had detected a smell of gas, and a serious explosion ensued. A flame shot up about 20 feet; the schoolyard was ripped up in places; and the houses in the neighbourhood were shaken. The Gas Manager escaped with slight injuries to his face. Only a few days previously, owing to escapes of gas, an alarming explosion occurred in the same town.

Extended Adoption of West's Retort-House Machinery.—We understand that the Birmingham Corporation have decided to extend the use of machinery to their Swan Village works, and have, in consequence, placed an order with West's Gas Improvement Company, Limited, for a complete set of their compressed-air machinery, of the same character as that which has for several years been in operation at the Corporation's Saltley works. The order includes coal-breakers, elevators, conveyors, hoppers, charging and drawing machines, and one of West's two-stage air-compressors, similar in construction to those at work in Manchester, London, Sydney, Plymouth, &c. The Company have also in hand a very extensive scheme of coal unloading, elevating, storing, and conveying machinery for the Danish Gas Company, at their Frederiksberg works. The Manchester Corporation are also extending the use of stoking machinery at their Bradford Road station; and they have instructed the Company to supply their compressed-air machinery, similar in all respects to that which has been working in the No. 1 house for the past 15 months. The two extensive retort-houses which comprise these works will then be completely fitted up with West's compressed-air stoking machinery.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Half-Yearly Report and Accounts.

The following report, with the accounts showing the working of the Company during the six months ending Dec. 31 last (given opposite), will be submitted to the proprietors at the half-yearly general meeting on Friday next:—

The accounts for the past half year show that, after providing for all fixed charges, there remains a balance of £594,049 19s. 3d., out of which the Directors recommend a dividend at the statutory rate of 12 per cent. per annum, carrying forward to the credit of the current half year the sum of £255,254 11s. 3d.

The improved financial position of the Company enables the Directors to announce that, as from the 1st of January, the charges for the hire of meters are abolished throughout the Company's district.

The weather during the months of November and December was very unfavourable for the sale of gas; so that, while the consumption up to the end of October showed the satisfactory increase, as compared with the corresponding period of 1893, of 4¾ per cent., the net result for the half year is an increase of 0·33 per cent. only.

The prices obtained for coke and tar products have been again exceptionally good; and the increase in the revenue from these sources has been considerably in excess of the amount of the reduction in the revenue from sulphate of ammonia, the market for which, owing to the agricultural depression and other causes, has been in a very unsatisfactory condition during the past few months.

The Directors have received from the Engineers of the several departments respectively certificates to the effect that the whole of the Company's plant is in a thoroughly efficient condition.

Following the report is the statement of accounts. As usual, we merely indicate the alterations that have taken place in those portions which are not subject to much variation; giving the rest in full.

Nos. 1 and 2 are the statements of stock, share, and loan capital, the totals of which on Dec. 31 last were as follows: Stock and share capital, £8,754,000; loan capital, £2,444,000. These amounts are the same as on June 30 last.

No. 3 is the capital account, the receipts on which (with premiums, £971,250) stand at £12,169,250. The expenditure is shown in the following items:—

Expenditure to June 30, 1894			£11,483,955 14 2
Expenditure during the half year to Dec. 31, 1894, viz.:—			
Buildings and machinery in extension of works	£73,686 6 4		
New and additional mains and service-pipes	11,657 19 10		
Do. do. meters	6,013 8 2		
Do. do. stoves	8,461 18 3		
	£99,819 12 7		
Cr. By sale of surplus land	£656 17 7		
By depreciation of plant	7,000 0 0		
Do. do. meters	4,340 0 0		
Do. do. stoves	6,288 0 0		
	18,284 17 7		81,534 15 0
			£11,565,490 9 2
Balance of capital account			603,759 10 10
			£12,169,250 0 0

Nos. 4 and 5 are the revenue and net revenue accounts. These are given in full on the next page.

No. 6 is a statement showing how the Directors propose to appropriate the balance applicable for dividend. It is as follows:—

Dec., 1893.		
£21,083 ..	Net balance brought from last account	£239,971 19 0
379,837 ..	Net revenue for the half year	354,078 0 3
£400,920		£594,049 19 3
(12 per cent.)	A dividend on the ordinary stock—	
£338,796 ..	12 per cent. per annum on £5,646,590	338,795 8 0
£62,124 ..	Balance carried to next account	£255,254 11 3

Nos. 7, 8, and 9 are the reserve and insurance fund and depreciation accounts. The first shows that the balance on June 30 last was £124,065, which was increased to £125,699 on Dec. 31 by the addition of £1634, interest on the sum invested. The insurance fund stood at £83,084 on June 30, and at £84,179 on Dec. 31. The depreciation fund amounted to £42,645 on June 30, and to £43,285 on Dec. 31.

Nos. 10 and 11 are as follows; Nos. 12 and 13 are given opposite.

No. 10.—STATEMENT OF COALS USED, ETC.

Description of Coal.	In Store, 30th June, 1894.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, 31st Dec., 1894.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common . .	87,127	1,105,936	902,130	6,464	284,469
Cannel . .	15,501	3,135	*4,810	—	13,826
Total . .	102,628	1,109,071	*906,940	6,464	298,295

* In addition to this quantity, oil and spirit, the equivalent of 27,542 tons of cannel have been used during the half year.

No. 11.—STATEMENT OF RESIDUAL PRODUCTS.

Description.	In Store, 30th June, 1894.	Made during Half Year.	Used during Half Year.	Sold during Half Year.	In Store 31st Dec., 1894.
Coke—tons	22,601	537,482	130,726	401,560	47,797
Breeze—tons	1,270	60,734	28,174	29,383	4,447
Tar—gallons	552,953	9,335,630	9,203,225	15,645	669,713
Ammoniacal liquor—butts	15,456	261,513	251,014	9,622	16,333

ACCOUNTS OF THE GASLIGHT AND COKE COMPANY FOR THE HALF YEAR ENDING DEC. 31, 1894.

No. 4.—REVENUE ACCOUNT.

Dr. Cr.

Dec. Half Year, 1893.	To Manufacture of gas—	£ s. d.	£ s. d.	Dec. Half Year, 1893.	By Sale of gas—	£ s. d.	£ s. d.
£564,783	Coals, including oil, dues, carriage, unloading and trimming (see Account No. 10)	552,236 4 8		£1,288,399	Common gas, per meter, at 3s., 2s. 10d., and 2s. 4d. per 1000 cubic feet	1,214,359 6 4	
11,697	Salaries of Engineers and other Officers at works	11,911 3 8		73,827	Public lighting and under contracts— Common gas (See Statement No. 12.)	75,714 6 11	
159,212	Wages (carbonizing)	161,092 2 11		£1,362,226			1,290,073 13 3
33,560	Purification, including £16,277/10/3 for labour	32,9.2 9 9		£29,126	Rental of meters	..	29,174 19 4
	Repair and maintenance of works and plant, materials and labour, less received for old materials,			8,860	Rental of stoves	..	9,523 1 2
175,230	£1904 4s. 8d.	161,899 12 2			Residual products—		
			920,041 13 2	£241,566	Coke, less £36,211 5s. 2d. for labour, &c.	250,289 9 10	
	Distribution of gas—			3,690	Breeze, less £1533 2s. 0d. for ditto.	5,484 18 11	
	Salaries and wages of Officers			62,221	Tar and tar products	81,188 11 7	
24,827	(including Rental Clerks)	24,940 1 2			Ammoniacal liquor and sulphate		
	Repair and maintenance of mains			65,404	of ammonia	60,026 11 7	
29,094	and service-pipes	31,782 8 10		£372,881			396,989 11 11
22,886	Repair and renewals of meters	21,865 13 7					
19,938	Stove fixing, repairs, and renewals	21,674 18 3					
			100,263 1 10	£3,975	Rents receivable		3,793 19 0
	Public lamps—			200	Transfer fees		210 12 6
16,879	Lighting and repairing	17,034 6 1		300	Canteen account		300 0 0
37	Experimental street lighting	..					
			17,034 6 1				
	Rents, rates, and taxes—						
3,181	Rents payable	3,271 0 0					
92,226	Rates and taxes	96,960 5 11					
			100,231 5 11				
	Management—						
2,750	Directors' allowance	2,750 0 0					
200	Company's Auditors	200 0 0					
	Salaries of Secretary, Accountant,						
7,561	and Clerks	7,692 6 0					
15,360	Collectors' commission	15,375 10 8					
3,812	Stationery and printing	4,012 7 0					
1,617	General charges	1,999 11 7					
			32,029 15 3				
1,450	Parliamentary charges	..	..				
8,254	Law charges	..	1,145 11 11				
8,288	Bad debts	..	7,673 19 9				
11,156	Annuities	..	10,731 17 7				
	Public Officers—						
888	Gas Referees and Official Auditor.	886 1 0					
820	Public testing-stations	784 16 10					
			1,670 17 10				
£1,212,051			1,190,822 9 4				
565,517	Balance carried to net revenue account, No. 5		539,243 7 10				
£1,777,568			1,730,065 17 2	£1,777,568			1,730,065 17 2

No. 5.—NET REVENUE ACCOUNT.

Dr. Cr.

Dec. Half Year, 1893.		£ s. d.	£ s. d.	Dec. Half Year, 1893.		£ s. d.	£ s. d.
£62,660	To Interest on debenture stocks and bonds, accrued to Dec. 31, 1894	..	62,659 12 6	£358,878	By Balance from last account	578,767 7 0	
74,015	Dividend on the preference stocks	74,015 5 0		337,795	Less dividend on the ordinary capital for the half year to June 30, 1894.	338,795 8 0	
47,500	Dividend on the maximum stocks	47,500 0 0					239,971 19 0
			121,515 5 0	£221,083			
1,505	Interest on temporary loans and sundry funds		990 10 1	565,517	Revenue account (No. 4)	..	539,243 7 10
400,920	Balance applicable to the payment of dividend on the ordinary stock		594,049 19 3				
£586,600			779,215 6 10	£586,600			779,215 6 10

No. 12.—STATEMENT OF GAS MADE, SOLD, Etc.

Description of Gas.	Quantity Made.	Quantity Sold.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	* 9,582,506	527,984	8,487,701	9,015,635	127,583	9,143,218	439,288	51,472
Dec. half year, 1893	9,556,100	522,582	8,463,042	8,985,624	134,297	9,119,921	436,179	51,057

* Including 511,761,000 cubic feet of "oil gas."

No. 13.—GENERAL BALANCE-SHEET.

Dr. Cr.

Dec. Half Year 1893.		£ s. d.	£ s. d.	Dec. Half Year 1893.		£ s. d.	£ s. d.
£	To Capital—			£			
742,903	Balance at credit thereof	..	603,759 10 10	67,987	By Cash at Bankers	..	187,469 6 8
	Net Revenue—						
400,920	Balance at credit thereof	..	594,049 19 3	150,000	Amount on deposit at interest	..	..
	Reserve Fund—				Amount invested—		
122,445	Balance at credit thereof	125,699 7 7			2¾ per Ct. Consolidated Stock . £206,614 0 6	..	209,170 6 4
	Insurance Fund—			208,566			
82,056	Balance at credit thereof	84,057 7 10			Stores on hand, viz.—		
			209,756 15 5				
	Depreciation Fund—			107,945	Coals	180,314 8 1	
42,015	Balance at credit thereof	..	43,285 0 0	11,302	Coke	26,760 7 6	
	Interest on debenture stocks and bonds,				Tar and ammoniacal liquor and		
62,660	due on Dec. 31, 1894	..	62,659 12 6	80,074	products	189,923 18 5	
	Preference and maximum dividends			202,765	Sundry stores	209,943 5 4	
121,515	due on Dec. 31, 1894	..	121,515 5 0				606,831 19 4
	Unclaimed dividends due on Dec. 31.				Accounts due to the Company, viz.—		
8,003	1894	..	8,003 18 9		Gas and meter rental—		
	Sundry tradesmen and others, for			955,973	Quarter ending Dec. 31, 1894	875,991 19 6	
	amount due for coals, stores, and			17,032	Arrears outstanding	16,064 1 1	
251,956	sundries	..	298,389 19 4				892,056 0 7
1,667	Benevolent Fund	..	1,667 6 8	37,309	Coke and other residual products	41,916 14 9	
				2,197	Sundry accounts	5,593 0 1	
							47,509 14 10
1,836,150			1,943,087 7 9	1,836,150			1,943,087 7 9

SOUTH METROPOLITAN GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report of the Directors of the above Company, which, with the accounts for the six months ending Dec. 31 last (given on the next page), will be presented to the proprietors at the half-yearly general meeting on the 13th inst.:—

This time last year, the Directors had to report a falling off of 2·17 per cent. in the quantity of gas sold. They have now the pleasure of announcing an increase of 7·33 per cent. over the corresponding period, and this, moreover, for a half year of generally mild weather, with an almost complete absence of fogs.

They have also to report an addition of 11,147 new consumers in the half year, of which 9103 were on the automatic, or "penny-in-the-slot," system. The total number of the last named up to the 31st of December last is, as shown in the revenue account, 25,516, and 12,033 of them are supplied with a small-size gas cooking-stove. Those without stoves burn, on the average, over 11,000 cubic feet a year, which is increased where there is a stove to over 19,000 feet. Of the total number of slot meters fixed since the start in 1892, only 729 have been disconnected; and nearly all of these have since been reconnected. The gas companies may take some credit for conferring a practical boon on the working classes by thus adapting the supply of gas to their circumstances; for it has been to the gas companies in various parts of the kingdom, and not to the municipalities supplying gas, that the working people are indebted for this great addiiion to their comfort and convenience. It is but just, in this connection, to say that the great success of this movement is largely due to the zealous exertions of all the principal officers of the Company, loyally and heartily seconded by their subordinates. In fact, it may be said that the highest success in working the Company can only be attained by all its servants having an interest in its prosperity, and being animated by a desire to promote its welfare, and working amicably together to that end. The Directors have pleasure in expressing their satisfaction with the general good-will manifested by their staff and workmen.

Coals, notwithstanding the unprecedentedly low freights, have cost rather more than in the two preceding half years. As to coke and ammonia, although these products began the half year with good prices, during its course, and especially at the end, both have fallen considerably, with the result that, although the output has increased about 7 per cent., there has been an actual falling off in money of £5300, or 3½ per cent. There has, however, been a slight improvement in the receipts from tar.

The whole of the works and plant of the Company are maintained in good condition; and the use of machinery whereby the cost of manufacture can be reduced is extending.

The Bill which the Directors are promoting has for its chief purpose the conversion of the stock from 10 per cent. to double the amount of 5 per cent. This is rendered necessary by the operation of the auction clauses, which require the Company to sell all new capital at the market price, with the result that capital bearing a nominal dividend of 13 per cent. has an actual dividend of less than 4½ per cent. at present prices. This anomaly and injustice the Bill seeks to remedy. It is not, however, necessary to deal further with it in this report, because a special circular relating to it has been sent to every shareholder, and a special meeting to consider it will be held at the close of the ordinary meeting.

One or two other Bills affecting the Company's interest have been deposited, which in the coming session will need to be watched, and probably opposed, in Parliament.

The profit earned in the half year enables the Directors to recommend the payment of the usual dividend at the nominal rate of 13 per cent., to be apportioned in accordance with the Scheme of Amalgamation, except £500 due to the "A" stock to be added to the reserve fund; and beyond this the price of gas of 2s. 4d. per 1000 cubic feet entitles to another ½ per cent. of dividend, or £5350. This they also recommend should be added to that fund, which will then stand at £66,920 11s. 8d. The insurance fund has been further increased by £5350 to £36,507 7s. 11d.; and the remainder, of £332 7s., will make the undivided balance £28,286 14s. 7d. The total reserves will therefore now amount to £131,714 14s. 2d.

Two Directors (Captain Heathorn and Mr. Simpson Rostron) and one Auditor (Mr. William Westcott) go out of office by rotation. They are all eligible for re-election, and offer themselves accordingly.

Following the report are the usual statements of accounts. As on previous occasions, we merely note the changes in the portions subject to but slight alteration; giving the remainder in full.

Statements Nos. 1 and 2 show the amount of share and loan capital raised at the close of the past year. The former stood at £2,140,000; the latter, at £775,000—an increase in the share capital to the extent of £4125 as compared with June 30 last.

Statements Nos. 3, 4, and 5—the capital, revenue, and profit and loss accounts—are given in full on the opposite page.

Statements Nos. 6, 7, and 8 show the positions of the reserve, renewal, and insurance funds. The reserve fund stood at £61,070 11s. 8d., as compared with £54,455 9s. 4d. on June 30—the difference consisting of interest on the amount invested, £775 8s. 7d.; and a fraction of dividend transferred from the net revenue account, £5839 13s. 9d.; the renewal fund, at £13,704 19s.; and the insurance fund, at £36,507 7s. 11d.

Statements Nos. 9 to 11—furnishing particulars as to the manufacturing operations of the Company—and No. 12, the general balance-sheet, are given in full.

Calverley and Horsforth District Gas Company.—The half-yearly report of this Company states that the net gas revenue, excluding meter-rents, amounted to £3135; residual products realized £1000; and from meter-rents and other sources, £218 was received—making a total of £4353. The expenditure amounted to £3065; leaving a balance of £1288 to carry forward to profit and loss account.

METROPOLIS GAS SUPPLY.

The Board of Trade and the Proposed Gas Inquiry.

The Public Control Committee of the London County Council have presented the following report on the subject of the agitation in regard to the price of gas in the district of The Gaslight and Coke Company north of the Thames, and the action of the Board of Trade with respect to the suggested public inquiry into the working of the London Gas Companies:—

We reported to the Council on the 17th of July last with reference to complaints which had been received of the high price charged by The Gaslight and Coke Company for gas supplied to consumers north of the Thames; and the Council made application to the Board of Trade to hold an inquiry into the present management and working of The Gaslight and Coke Company, and asked that the inquiry might include the questions of the advantage or otherwise of the enrichment of gas, and of the use of the portable photometer for purposes of testing gas. A letter has been received from the Board of Trade, calling attention to the reply made by the President to a deputation which waited upon him in August last on the subject of the gas supply of London. The deputation consisted of representatives of all the North London Vestries, the Holborn District Board of Works, and the Gas Consumers' Protection League, and asked for a parliamentary inquiry. The President, in his reply, referred to the fact that two different kinds of inquiry were asked for, and that the subjects sought to be included in the inquiries were very various—ranging from some quite small and simple to some very large—raising important issues of policy, such as the question of the amalgamation and union of all the Companies, and that of the possible ultimate acquisition by a public authority of the Gas Companies' undertakings. He drew attention to the consequent difficulties of determining the kind of inquiry; and he stated that he should require to know whether, on the whole, the balance of opinion was in favour of a Board of Trade or a parliamentary inquiry. He also reminded the deputation that, in the case of a Board of Trade inquiry, the Treasury would have to make provision for the expense, and that there were some doubts as to the powers of the Board in the matter. As to a parliamentary inquiry, the President stated that, having regard to the magnitude of some of the issues raised affecting investments made on the faith of a parliamentary bargain, he could give no opinion without consulting his colleagues. At the same time, he expressed regret that the hands of Parliament and of London were tied in the way they were by existing statutes. Recognizing the hardship under which consumers north of the Thames suffered, he promised careful attention to the whole subject. In conclusion, the President pointed out that a Board of Trade inquiry could only go to what might be called the minor aspects of the subject. If legislation was desired, and especially if it was desired to be of a searching and important kind, it was quite clear that Parliament would not be satisfied with anything less than a parliamentary inquiry as a preliminary to such legislation. In the letter from the Board of Trade, attention was drawn to the fact, that at a meeting of representatives of Vestries and District Boards, held on the 2nd of October last, it was decided to petition Parliament to institute a parliamentary inquiry on the subject of the management, working, and charges of the London Gas Companies, with the view of securing uniform charges, with free use of meters, increased illuminating power, and further facilities for testing the gas.

MANCHESTER CORPORATION GAS AND WATER DEPARTMENTS.

The Reduction in Price—Proposed Abolition of Meter-Rents—The Collection of the Gas and Water Accounts.

Among the business on the *agenda* for the meeting of the Manchester City Council to-morrow are recommendations by the Gas Committee that the charge for the hire of gas-meters within the city be abolished, and the price of gas used for other than lighting purposes be reduced from 2s. 6d. to 2s. per 1000 cubic feet, at the close of the current financial year. The notices of motion include one by Mr. Greenhow, instructing the Gas and Water Committees to report as to the advisability of making arrangements whereby the accounts of the two departments can be collected by one set of officials.

With reference to the recommendation as to the abolition of the meter-rents, it will be remembered that when the Chairman of the Gas Committee (Mr. Alderman Gibson) introduced the subject to the notice of his colleagues at their meeting last Tuesday week, they did not regard it in a favourable light, and rejected a proposition which he then made. However, further considering the matter last week, they agreed that, with the approval of the Council, meter-rents should be abolished within the City—from the end of the current financial year. It was felt that, as separate meters will be necessary to enable consumers to take advantage of the reduced price, the concession would be to a considerable extent nullified if meter-rents were to be charged. Hence the decision now arrived at. The reduction in price and the abolition of the meter-rents will entail a loss of revenue to the amount of about £21,000. But the consumption of gas is at present increasing, in spite of the competition of the electric light; and it is hoped that the changes contemplated will result in a much greater increase, and in this way the loss of revenue may prove only temporary.

Chester United Gas Company.—The half-yearly general meeting of this Company is to be held on Thursday next, when the Directors will recommend the payment of the full statutory dividends. For this purpose, £4421 will be available. The sale of gas and residuals, with meter and other rents, produced £15,346; and the expenditure amounted to £10,820—leaving a balance of £4526. The Directors refer to the gas exhibition organized by them in November last, and carried out under the able supervision of their Engineer and Manager (Mr. Robert Hunter); and they state that it produced most satisfactory results to the Company.

ACCOUNTS OF THE SOUTH METROPOLITAN GAS COMPANY FOR THE HALF YEAR ENDED DEC. 31, 1894.

No. 3.—CAPITAL ACCOUNT.

Dr.

	£ s. d.	£ s. d.
To Expenditure to June 30, 1894	..	3,203,855 0 3
Expenditure during half year to Dec. 31, 1894, viz.—		
New buildings and machinery in extension of works	8,347 9 2	
New and additional mains and services	14,913 0 9	
Do. meters	25,190 9 2	
Do. stoves	17,058 11 4	
		65,509 10 5
Total expenditure	..	3,269,364 10 8
Balance	..	120,534 9 4
		3,389,899 0 0

Description of Capital.	Certified to June 30, 1894.	Received since that Date.	Total to Dec. 31, 1894.
	£ s. d.	£ s. d.	£ s. d.
By A stock	500,000 0 0	..	500,000 0 0
B stock	1,350,000 0 0	..	1,350,000 0 0
C stock	285,875 0 0	4,125 0 0	290,000 0 0
Debenture stock, 5 per cent.	775,000 0 0	..	775,000 0 0
	2,910,875 0 0	4,125 0 0	2,915,000 0 0
Premium capital	468,505 5 0	6,393 15 0	474,899 0 0
	3,379,380 5 0	10,518 15 0	
			3,389,899 0 0

Cr.

No. 4.—REVENUE ACCOUNT.

To Manufacture of gas—		
Coals into store, including cost of petroleum spirit for enriching. (See Account No. 9)	£202,954 8 1	
Purification, including £4778 7s. 2d. for labour.	10,868 2 10	
Salaries of Engineer and Officers at works	5,681 1 3	
Wages (carbonizing)	49,528 19 4	
Repairs and maintenance of works and plant, including £34,884 9s. 4d. for labour, less £1078 12s. 6d. received for old materials	67,925 1 2	
		£336,957 12 8
Profit sharing		£6,000 0 0
Distribution of gas—		
Repair, maintenance, and renewal of mains and service pipes, including £10,254 18s. 4d. for labour	£14,016 9 11	
Salaries, &c., Officers and Rental Clerks	9,903 16 8	
Repair, &c., of meters (£913 2s. 10d. for labour)	5,971 13 0	
Repair, &c., of stoves (£1981 5s. 10d. labour)	7,143 15 10	
Gas fittings (labour)	5,031 15 10	
		42,124 11 3
Public lamps—lighting and repairing		6,080 1 11
Rents, rates, and taxes		20,617 2 7
Management—		
Directors' allowance	£1,750 0 0	
Salaries of Secretary, Accountant, and Clerks	1,910 17 1	
Collectors	5,987 14 9	
Stationery and printing	1,218 5 10	
General charges	3,226 4 9	
Company's Auditors	112 10 0	
		14,205 12 5
Law charges		1,203 1 9
Bad debts		1,695 7 7
Pensions and officers and men's superannuation and sick fund		2,920 19 6
Gas Referees and Official Auditor		216 11 7
Leasehold renewal fund		500 0 0
Total expenditure		£432,524 1 3
Balance carried to net revenue account (No. 5)		169,573 0 5
		£602,097 1 8

By Sale of gas—		
Michaelmas, at 2s. 4d. per 1000 feet	£133,802 13 6	
Christmas, at 2s. 4d. per 1000 feet	248,723 3 9	
	£382,615 17 3	
Public lighting and under contracts (see Statement No. 11)	30,256 13 3	
		£412,872 10 6
Meters in use, 113,558—		
Company's meters at rent: Ordinary, 73,219; automatic, 25,516	£10,488 18 1	
Stoves at rent: Ordinary, 26,307; auto., 12,033	6,813 4 0	
		17,302 2 1
Residual products—		
Coke, less £12,195 19s. 0d. for labour, &c.	£107,868 12 2	
Breeze, less £1920 9s. 0d. for labour, &c.	3,413 5 0	
Tar, less £328 14s. 2d. for labour, &c.	24,498 12 8	
Ammoniacal liquor, less £177 6s. 8d. for labour, &c.	23,029 12 2	
Sulphate, less £3103 10s. 11d. labour, acid, &c.	11,492 4 1	
		170,102 6 1
Rents receivable		1,756 18 0
Transfer fees		63 5 0
Total receipts		£602,097 1 8

No. 5.—PROFIT AND LOSS (NET REVENUE) ACCOUNT.

Interest on temporary loan and deposits		£940 5 5
Interest on debenture stock		18,729 3 4
Amount carried to insurance fund		5,350 0 0
Balance applicable to dividend on the ordinary stock		172,736 14 7
		£197,756 3 4

Balance from last account		£172,078 19
Less—Dividend for half year ended June 30, 1894	£138,284 18 3	
Dividend undivided carried to reserve fund	5,839 18 9	
		144,124 12 0
		£27,954 7 7
Amount from revenue account (No. 4)		169,573 0 5
Interest on Bankers' balances		228 15 4
		£197,756 3 4

No. 9.—STATEMENT OF COALS.

Description of Coal.	In Store, June 30, 1894.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, Dec. 31, 1894.
	Tons.	Tons.	Tons.	Tons.	Tons.
Newcastle coal	37,507	408,759	373,408	370	72,488
Cannel coal	1,557	3,990	3,955*	..	1,592
	39,064	412,749	377,363	370	74,080

* 113,555 gallons of petroleum spirit used as a substitute for cannel.

No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

—	In Store, June 30, 1894.	Made during Half Year.	Used in the Half Year.	Sold in the Half Year.	In Store, Dec. 31, 1894.
Coke—cwt.†	152,462	4,643,551	961,446	3,356,104	478,553
Breeze—yards	1,002	67,261	11,458	50,513	6,292
Tar—gallons	209,304	3,753,145	16,393	3,588,402	357,655
Ammoniacal liquor—butts.	9,783	121,236	32,614	81,033	17,372

† 1 cwt. of coke about equals 1 sack of 4 bushels, under Weights and Measures Act, 1878.

No. 11.—STATEMENT OF GAS MADE, SOLD, ETC.

Description of Gas.	Quantity made.	Quantity Sold.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	3,848,872	213,605	3,307,860	3,521,465	51,349	3,572,814	276,058	19,351

No. 12.—BALANCE-SHEET.

To Capital—		
Balance—per account No. 3		£120,534 9 4
Reserve fund—per account No. 6		61,070 11 8
Renewal fund—per account No. 7		13,704 19 0
Insurance fund—per account No. 8		36,507 7 11
Net revenue account—for balance, per account No. 5		172,736 14 7
Debenture interest, for amount due to Dec. 31, 1894		18,729 3 4
Sundry tradesmen, for amount due for coals, stores, and sundries		50,609 7 2
Deposits by consumers		25,751 0 6
Dividend account (outstanding)		1,017 0 5
Debenture account "		60 18 3
Workmen's bonus and savings deposited with the Company		31,732 7 4
Officers' superannuation and guarantee funds		19,674 16 7
Debenture stock subscriptions		2,500 0 0
Temporary loan		30,000 0 0
		£584,628 16 1

By Cash at Bankers		£14,575 10 1
Amount invested (reserve fund, £54,600 11s. 8d.; renewal fund, £12,578 12s. 9d.; insurance fund, £20,098 6s. 11d.)		87,272 11 4
Cash in hand for sundry payments		500 0 0
Stores in hand—		
Coals and enriching materials	£39,712 12 4	
Coke and breeze	10,284 9 1	
Tar, sulphate, and ammoniacal liquor	7,686 3 2	
Sundry stores	94,242 16 0	
		151,876 0 7
Investment of workmen's bonus, &c.		7,320 12 0
Accounts due to the Company—		
Gas, meter, and stove rental, quarter ending Christmas, 1894	£259,970 6 2	
Arrears outstanding	1,501 19 3	261,472 5 5
Coke and other residual products		36,122 3 2
Balance due for automatic gas-fittings		21,597 10 6
Sundries		3,892 3 0
		£584,628 16 1

PARÁ GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Thursday, at the London Offices, No. 16, St. Helen's Place, E.C.—Mr. ULICK J. BURKE, in the chair.

The SECRETARY (Mr. T. S. Borradaile) read the notice convening the meeting; and the Directors' report and accounts, to which attention was called in last week's issue, were taken as read.

The CHAIRMAN said that, as foreshadowed in the report, there was not much to say in regard to the accounts—in point of fact, as the shareholders would have seen, they were practically the same in the half year ending in September as they were in the preceding six months. Comparing the figures in the revenue accounts for those two periods, the amount spent on coal during the second half year was £5656, as against £6763. The amount paid in wages was £3956, as compared with £3859; and the other expenses were very much alike. Then, on the opposite side of the account, the return for public lamps was £7083 for the six months ending in September, as against £7081 in the March half year; and the income from private lights was £2303, against £2473. The items public establishments, illuminations, and coke were nearly the same; there being, on the whole, a very fair return. He might say, in reference to their coal supply, that the Company had been handicapped for a long time in the summer months by the question of quarantine. This caused the Board a great deal of anxiety; but if there were any convenient quarantine stations for Pará, it might not be so bad. The only station now was at Ishla Grande, which was about 2000 miles from Pará; so the shareholders could imagine the delay that was caused if quarantine was established. The matter had lately been taken up by our own Foreign Office; and he should like to read a letter from that department which appeared in *The Times* for the 17th of January. The letter was in reply to some representations from the London Chamber of Commerce on the subject of the Brazilian quarantine arrangements. It stated that the Brazilian Minister for Foreign Affairs had informed Her Majesty's Chargé d'Affaires at Rio de Janeiro that Tamandare had been definitely chosen for the new station, and that, in the opinion of the head of the Commission charged with the works, they would be concluded in three years. Her Majesty's Chargé d'Affaires had again urged on the Brazilian Government the great need of more quarantine stations, and had inquired what provisional measures were proposed for the three years during which the new station would be in course of construction. He would, the letter intimated, continue to press this important matter on the attention of the Government. Proceeding, the Chairman said this communication showed that the Foreign Office were taking some steps in regard to this important question. It was very desirable that the Company should be able to count upon more certainty with respect to their coal supply. Reverting to the subject of public and private lights, he said these, as the accounts showed, were in much the same position. The question of development, especially in the private lighting, must, of course, depend upon what the Company were able to do. They had been hampered year after year—particularly in the last few years—by the constrained state (if he might so call it) of their concession. Their actual concession expired in 1892; and notwithstanding all the efforts they had made to induce the Government to give the Directors some idea of what would be acceptable to them, all they had been able to do as yet was to get the concession prolonged for one or two years, fifteen months, and so on. He need hardly say that, as remarked in the report, these temporary arrangements put the Company under the greatest possible disadvantage. There were a considerable number of improvements being introduced in the gas world, which European gas companies were able to avail themselves of—largely to the benefit both of the consumers and the shareholders. For instance, he might mention the question of the enrichment of gas by carburine, and the incandescent gas-light, which was now being employed to an enormous extent, and seemed to be a great rival of the electric light. *Plus* that, there was the question of the development of the works; but they could not undertake this while they remained in the present uncertain state—so long as a new concession was not granted, they could not go on spending capital. Only recently, the use of acetylene as a carburetting material had been proposed; and this had caused a large amount of interest in the gas industry. But, under existing circumstances, they would be unable to take advantage of this. It must therefore be manifest to the shareholders that, until the Company obtained some more certain basis for their concession, they could not attempt to benefit by the aids which were provided for them by contemporary science. The Company also suffered through the duties which were imposed upon them. It was true that in extending from October, 1894, the concession for twelve or fifteen months, at the option of the Government, it had been promised that they should be exempt from duties on coal; but he need hardly say that they could not absolutely trust that they would obtain all that had been promised, because it did not quite accord with their experience that promises as to the remission of duties were always realized. The enormous sum which had been due to them in the shape of duties had never been actually recovered. Consequently the Directors could not reduce the price of gas as they would like to; and therefore the consumers had in effect to supply the money for the duties, as they had to pay a higher rate for gas. This was the present position of affairs; and now the question which most concerned the shareholders was, What was to be done in reference to the concession? In July last, the shareholders were advised that the Directors had made an arrangement with the Government for the trifling extension to which he had referred. Supposing the Government were to take advantage of the option of fifteen months, that would take them up to January, 1896; so that, in any case, they had only one year of the concession left. It therefore behoved them to look very carefully into what their position was at present. An electric light tender had been accepted; and for all they knew, it might be found to be of use in Pará. When he said "use," he did not anticipate that it would actually take the place of all other illuminants; but, of course, it was a factor they had to consider in offering to continue on any renewed short terms. What, then, were they going to do? In October this year, or the following January, unless the Government again offered a short renewal, the Company would be at the end of their tether. Well, he honestly confessed that he, for one, would not be prepared to advise the shareholders to go on working from year to year on this unsatisfactory basis. The Directors were hoping that in a few days they would see their Manager (who was on his way home); and then they would be better able to ascertain, *vivâ voce*, the state of the works. It was quite evident that, at the end of 30 years, the condition of the underground plant was such that, while they were made to go on in this temporary way, it would not be worth while to investigate it. He therefore proposed that, unless some very definite arrangements were made, the shareholders should be called together, and their opinions taken as to what was the best course to adopt—either they might re-form the Company, and take such terms as they could get from the Government, or wind up the concern. It would not be any good for the Company to take a speculative concession, even if they could get it. The Government said their only mode of granting a concession was by tender. The Directors had great legal difficulties in sending in such a tender; and, so far as he could see, the only course for them would be to sketch out a plan such as the Government would be likely to accept, and then for those shareholders who chose to support it to agree that they would take it on those terms. This could not be done by the Board; it must be actually done by the shareholders. Before concluding, the Chairman referred to the sale of the Company's property in the Rue St. Antonio, for which £3600 was realized, and stated that the Directors were now taking steps to dispose of the Cocaolinho property. This had been in their possession for a long time; and it might not be many years before it developed into a valuable estate. Their business, however, was to make and sell gas, and not to be land speculators. As time was getting shorter, it was better that they should not have too much of this land on their hands. He then moved the adoption of the report and accounts.

Mr. A. H. HENRY seconded the motion, which was at once unanimously adopted.

On the proposition of the CHAIRMAN, seconded by Mr. C. W. C. GIVENS, dividends were declared at the rates per annum of 7 per cent. on the £5 per share called up on the preference shares, and 2 per cent. on the ordinary shares.

Resolutions were then moved by the CHAIRMAN, and seconded respectively by Mr. H. C. GLADON and Mr. P. CRELLIN, re-electing the retiring Directors (Messrs. Henry and Givens); and afterwards Messrs. Crellin and Bain were appointed Auditors, on the proposition of Mr. BUTLER, seconded by Mr. E. B. THORNTON.

The services of the Chairman and Directors were duly acknowledged; and the proceedings then terminated.

THE FORTHCOMING INTERNATIONAL EXHIBITION IN AMSTERDAM.

In the JOURNAL for Nov. 13 last, we announced that a project was on foot for holding in Amsterdam, from May to November in the current year, an international exhibition under the patronage of H.M. the Queen-Regent of the Netherlands. Its main object, according to the title, is to show the progress made in erecting and furnishing hotels, and in the various modes of transport; but it will, of course, include a great number of miscellaneous goods. According to the general programme, exhibits will be classified in sixteen groups, three of which will be devoted to articles connected with lighting, heating, and health. In the first-named group, an endeavour will be made to have a representative display of the four illuminating agents—candles, electricity, gas, and petroleum—and to show how these may be best employed for the lighting of houses, halls, offices, ships, railway carriages, and other travelling conveyances, as well as of open spaces; and in conjunction with them, various appliances will be shown. In the group of heating exhibits, gas-stoves may be expected to occupy a good place—provision having been made for their reception in Class A (Stoves, Hearths, Calorifères); and they may be seen in action. The third-named group will include baths, lavatories, water-pipes, and ventilating appliances. Machinery for the production of electricity for motion and lighting, of steam, hot air, &c., will be on view. Awards—consisting of crosses of honour, gold, silver, and bronze medals, and certificates—will be granted by an international jury, subject to rules to be fixed; and they will be distributed before the close of the exhibition. The arrangements are in the hands of an Executive Committee, of whom Dr. N. A. Calisch is the President, Mr. G. van Mesdag, Vice-President, and Dr. F. Foekens, Secretary. A very strong local Auxiliary Committee, composed chiefly of experts, has also been formed, of which Mr. H. Salomons, Manager of the works of the Imperial Continental Gas Association, is a member. There is also a British Consultative Committee, of which Sir Albert K. Rollit, LL.D., M.P., President of the Associated Chambers of Commerce of the United Kingdom, is the head; his colleagues all being gentlemen of position and influence. Dr. Calisch and Mr. van Mesdag are now in England; and last Wednesday they invited the members of the British Committee and representatives of the Press to luncheon at the Savoy Hotel, in order to inaugurate the Committee and make known to the general public of this country the aims and objects of the projectors of the exhibition. These were concisely stated by the above-named gentlemen in excellent English; while the value of exhibitions in general, in drawing closer the bonds of international commercial relationship, was dwelt upon at more length by Sir A. Rollit. Hearty good wishes were expressed for the success of the enterprise; and cordial support was promised on behalf of the Associated Chambers of Commerce and by gentlemen who are in a position to help to bring about that consummation. The representatives of the Executive Committee in London are Reuter's International Agency, Limited, 25, Old Jewry, E.C.

The Bridgend Dinas Brick Company, Limited, has been registered with a capital of £5000, in £5 shares, to adopt an agreement made between A. Emerson and S. Llewellyn, and to carry on the business of fire and other brick and tile manufacturers, or dealers in silica, sandstone, &c.

ELECTRIC LIGHTING NOTES.

It was announced at last week's meeting of the Liverpool Corporation Lighting Committee, that negotiations are still proceeding with the Electric Lighting Company for the purchase of their undertaking; but the matter had not sufficiently advanced to justify any public statement on the subject. Notwithstanding this, a notice of a resolution is on the *agenda* for the meeting of the City Council to-morrow, in which the Committee will ask the members to approve of their intention to make application to the Board of Trade for a Licence authorizing the Corporation to supply electricity, for public and private purposes, within the area comprising the whole of the city.

The Gas and Electricity Committee of the Bolton Corporation have resolved that, as from the 1st ult., the differential scale of charges for the supply of electricity is to be abolished, and a uniform rate of 6d. per Board of Trade unit made to all consumers, subject to a discount of 10 per cent. on payment within 21 days of the delivery of the account. It is proposed to borrow a further sum of £18,000 for an extension of electric lighting in the borough; and application will be made in due course to the Local Government Board for the requisite sanction.

The Yorkshire House-to-House Electricity Company, whose business is carried on in Leeds, have issued their report upon the first full year's operations. It shows a profit (including £155 brought forward) of £3671, which is to be utilized in writing off the balance of preliminary expenses, £1185, setting aside £500 to reserve, and paying a dividend at the rate of 4 per cent. per annum upon the ordinary shares. The dividend will require £1823; so that £162 remain to be carried forward to the current year's account. On Dec. 31 last, the number of lights connected to the mains was equivalent to 19,858 35-watt lamps; while on Dec. 31, 1893, the number was 10,647—showing a large increase for the year. An agreement has been entered into with the Leeds Corporation, under which the Company will shortly commence to supply all the electrical energy required in lighting the Town Hall and Municipal Buildings, where lamps equivalent to about 6000 35-watt lamps are installed. With the view of encouraging the use of electricity for other purposes than lighting, the Directors have decided to supply current for cooking, heating, and power purposes, at the price of 3d. per Board of Trade unit. New plant is expected to be completed during the coming summer; and the engines then at work will have an aggregate capacity of 1800 indicated horse power.

A majority of the Fareham Urban District Council are opposed to the proposal of their predecessors to purchase the undertaking of the local Electric Light Company; and they have passed a resolution asking the Local Government Board to withhold consent to the borrowing of £7000 for the purpose. On the same occasion, a letter was read from that body, stating that the effect of communications addressed to them, and the consideration of evidence taken at the recent inquiry into the matter, led to the conclusion that it was doubtful whether the contemplated purchase met with the general approval of the ratepayers; and having regard to the fact that the Urban Council had come into office since the application for sanction to the loan was submitted, the Board had decided to defer dealing with the application until informed whether the Council desired to proceed with the matter. The question will be further considered at the February meeting.

With all due ceremony, the municipal electric station at Wolverhampton was opened by Lord Kelvin in the presence of the Mayor (Alderman C. T. Mander), the members of the Corporation Lighting Committee, and other gentlemen. The buildings are situated in Commercial Road, and cover an area of 1330 square yards. In the boiler-house are placed three Lancashire boilers, 30 feet long by 8 feet in diameter, which are fitted with Green's economizers. There are three engines, one of 125 and two of 250 horse power; and they are capable of supplying electricity for about 6000 8-candle power lamps. Under the present scheme, only the centre of the town is to be lighted by electricity. The installation has involved the Corporation in an expenditure of between £25,000 and £26,000. After Lord Kelvin had turned on the current, and the plant had been inspected, the company were entertained to luncheon by the Mayor, who later on informed his guests that the Lighting Committee had received 59 applications for the light, representing 4161 8-candle power lamps. Lord Kelvin, in responding to the toast of his health, spoke in praise of the high-pressure system that had been adopted. Referring to the possibility of obtaining dynamos capable of producing a voltage of 20,000, he said that, up to the previous day, he had never seen a dynamo capable of producing a voltage of 2000; but he had now seen one at the station which they had opened that day. At Oxford the current never exceeded 1000 volts, but at Wolverhampton it could be maintained at 2000 volts; and this showed the progress which had been made.

A proposal has been set on foot for carrying out an interesting experiment in electric lighting in large sections of the Rhondda Valley. The Urban District Council recently appointed a Committee to formulate a scheme; and it has been suggested to them that an adequate supply of electricity for the whole of the valleys could be obtained from installations at the collieries, and at a price much below that of gas. Communications have been received from collieries favourable to the scheme; and it is stated that the general opinion of the mining engineers of the district is that it would be a success.

It is regrettable that we should have to chronicle another explosion in connection with an electric lighting box—this time at Dover. It occurred last Thursday, and, according to the report which has reached us, under somewhat peculiar circumstances. Although the chamber was only about 8 feet in cubical capacity, there was a loud report; the iron covering being blown off. The contention that the explosions which have taken place elsewhere recently are produced by gas generated by means of the electric current, seems to be disproved by this explosion, as the electric station is not completed, and the mains had never been charged. Some operations were being carried on with a light in another street-box about 30 yards away. It is stated that, immediately after the explosion, there was a strong smell of coal gas in the box in which the men were working, although it was not detected before.

A much more serious affair occurred on Southwark Bridge shortly before two o'clock on Friday afternoon. At that time, considerable alarm was caused by an explosion in four electric light boxes near the centre of the bridge on the Surrey side. The force of the explosion blew up the pavement and wrecked the framework of the covers on the boxes. A large hole was made in the pathway close to a sewer grating contiguous to some other junction-boxes; but the latter were unaffected. Soon after the occurrence, several of the officials of the City of London Electric Lighting Company arrived on the spot; and it is reported that they attributed the explosion to an escape of gas from a meter fixed to register the supply of gas to the bridge, and its ignition by a lighted match thrown down the gully. Here, however, no explosion took place. We believe that an official of the South Metropolitan Gas Company, who supply the gas used on the bridge, made an examination, and discovered that there was an escape of gas from the main under the carriage-way, and that the gas had passed into the culvert under the footway where the first explosion happened; but it could not be definitely ascertained how the gas became ignited. Five persons were injured by the explosion, four of whom were conveyed to Guy's Hospital; but none of the cases were sufficiently serious to necessitate detention after they had been treated. A communication was sent to Major Cardew, at the Board of Trade, who, it is understood, will hold an inquiry into the matter in due course.

Reference was made last Tuesday to an explosion which had occurred at Rochester. On the following day, Major Cardew inspected the scene, in the presence of Mr. Hurrell, Electrical Engineer and Managing-Director of the Chatham and Rochester Electric Light Company. The statement of Mr. Hurrell was to the effect that the explosion occurred at the Company's No. 7 sub-station, and that about 20 paving-stones round and near the iron cover had been displaced. The explosion had, he said, resulted from an accident which might possibly never occur again. A spark had been found playing upon a brick, which had fallen, owing to its being displaced by frost, on the high-tension terminal, and on the iron tube of the low-tension main. He attributed the explosion to a faulty gas-main, and the escaped gas coming in contact with the electric current. Major Cardew intimated that he would submit a report to the Board of Trade, who would decide whether or not his visit should be followed by an official inquiry. In curious falsification of Mr. Hurrell's statement, another explosion, at the same spot, and apparently from a similar cause, took place on Saturday. We presume, therefore, that the Board of Trade will now order an investigation to be made.

The dangers of electric currents were further exemplified last week in the following letter, addressed to *The Times* by Mr. E. Evans-Lloyd, from Bordeaux, on the 25th ult.: "It is hardly necessary to insist on the dangers incident to electric currents; but, having been a witness of the fatal results of a careless manipulation of the machinery in connection with the electric tramway here, I venture to send you a short account of what happened in Bordeaux yesterday afternoon. It seems that the telephone wires run overhead parallel with those of the tramway, and that during certain repairs to the former wires they broke, and, in their fall, became entangled with a horse, which was drawing a carriage in one direction, and with another horse in a cart going the opposite way. The result was that both horses were killed instantaneously, as well as four unfortunate dogs happening at the same moment to be in the street. The driver of the carriage received an alarming shock, and was for some minutes riveted to his seat, though after a time he recovered. I shall not soon forget the pitiful sight of the two dead horses lying at the side of the Route du Médoc—victims of this new form of electrocution."

The story told by Mr. Evans-Lloyd is bad enough; but, fortunately, no serious personal injury was one of its incidents. Far different was it, however, in a case reported to us from Georgetown (British Guiana), where a groom named Lynch, 28 years of age, was struck down and killed, on the evening of the 27th of December last, while turning on an incandescent electric lamp hanging outside the stables in which he was employed. At the inquiry into the circumstances, it was stated that, a light being required for attending to the racehorses, which were restless, deceased turned on the light—an ordinary 16-candle power lamp; but no sooner had it "glimmered" than it went out, and Lynch fell to the ground, crying out that he had been "knocked down by the light." A companion named Headley then attempted to turn on the light; but he received a shock which also knocked him down. He soon recovered, however, and went to Lynch's assistance; but the poor fellow was dead. It subsequently transpired that another groom and the watchman had received shocks from the lamp. A report on the occurrence had been made to the Governor by the Electric Lighting Inspector (Mr. S. Vyle); and this document was read at the Coroner's inquiry. Mr. Vyle gave the following particulars and explanation: "The lamp was suspended above the bare ground; and the man, trying to turn it on, being without boots, and his bare feet on the ground, appears to have received a shock from the outside brass of the lamp. With only 50 volts pressure, he ought not to have felt anything severe; hence the implied leakage from the high tension of 1000 volts into the low-tension wires, at the transformer near. The Electrical Engineer of the Electric Lighting Company (Mr. A. H. Shaw), having brought the transformer to their station, tested it, and revealed leakage; which I, by a separate test, confirmed—proving the passage of the primary current into the secondary, or lighting circuit. But a leakage to the 'earth' or ground on another part of the circuit contributed to the poor fellow's death, which the absence of his boots cost him, as a second man touched the same lamp and got knocked down by the shock, but felt little worse thereafter. It is quite possible, but dangerous, to work an electric light circuit, as we do the telegraph, with one open wire, connected to the earth at either end; but the safer and usual way is two wires." Mr. Vyle added that it was to be regretted that previous slight shocks had never been reported; and therefore, as all the lights were burning satisfactorily from that particular transformer, no indication was given of its being other than in good order. So singular a combination of events—viz., the leaking of the transformer, the "earthing" of the circuit at one end by contact with a telephone wire, and the "earthing" of the other side of the circuit by the man standing on bare ground with his naked feet—bringing about so serious a result, he had never known. Asked by one of the jury (who had been specially selected by the Coroner for

their experience in electrical matters) if he could explain what was the safeguard, or whether there was one, to the consumer who used electric light, against the high-tension current entering the wire carrying the house service, Mr. Vyle replied that the public were protected by the fact that there was a rough insulation in every house, and he scarcely thought sufficient current would pass from a lamp to seriously injure anyone; but there was at present no device in general use for preventing the high-tension current passing into the low-tension mains in the degree that took place in the case under consideration. He added that Major Cardew was of opinion that there were no practical means of preventing this. The medical report, showing death to have been caused by electricity, having been put in, the jury returned a verdict in accordance therewith; adding that they found, from the evidence, that the fatal shock was brought about by the co-existence of at least three abnormal conditions at the time.

THE YORK CITY COUNCIL AND THE WATER-WORKS.

Opposition to the Water Company's Bill — Proposed Purchase of the Undertaking.

The York City Council have recently held two meetings for the purpose of considering the provisions of the Bill which has been promoted by the York New Water Company, and discussing a resolution authorizing the opening of negotiations with the Directors for the purchase of the undertaking. The first meeting was held on the 23rd ult.; the LORD MAYOR (Alderman M'Kay) presiding.

Alderman CLAYTON, the Chairman of the Water Committee, read the Bill, the preamble of which set out that additional capital was required, and that the Company wished to extend their supply to Bishopthorpe, Water Fulford, Huntington (east and west), Earswick, and Towthorpe. They also desired to add 60,000 new shares to the capital, and to extend their borrowing powers. Mr. Clayton pointed out that, if the Corporation were in favour of buying the works, it was desirable that they should oppose the Bill, and next year apply for powers for taking over the concern. He stated that the capital of the Company was £140,000; but if the shares were purchased at the present market value, the cost would be £314,000. The Solicitors to the Company had written, stating that the Directors had no wish to sell their undertaking. In conclusion, he moved the following resolution: "That the water supply of the city should be under the control of the city, and that the Corporation petition against the Company's Bill, and negotiate with the Directors for the purchase of their undertaking."

Mr. SHAFTO seconded the motion.

Alderman WRAGGE moved, as an amendment, that a petition be lodged in opposition to the Bill, and that the Committee be asked to ascertain what advantages, if any, accrue to the ratepayers of boroughs where the water undertaking is in the hands of the Corporation, either in the rate charged or in the supply; and in the event of York comparing unfavourably with those boroughs, that the Committee should draw up a report setting forth what concessions are required to place the ratepayers on an equality with the ratepayers of those places.

Alderman DODSWORTH seconded the amendment, and named four or five towns where the Corporations had acquired the water-works, and had had to pay heavier rates in consequence.

Alderman CLAYTON produced a list of 36 towns in Yorkshire and Lancashire where the water-works had been purchased by the Corporations, and where the money had been borrowed for the purpose; the Local Government Board allowing, in the majority of the cases, from 60 to 100 years for the repayment of the loans—a few being at 30 years.

A long discussion followed, after which a vote was taken on the amendment, to which had been added words requesting the Committee to report specially on the subject; but it was rejected. It was then agreed that information on the question should be printed and circulated among the members of the Council, and that the discussion be adjourned till the following Thursday. On that day,

Alderman CLAYTON contended that the Corporation could take over the works, and maintain them without the assistance of a rate-in-aid in addition to the water-rate at present charged. Supposing they had to hand over £356,666 worth of York Corporation 3 per cent. stock in exchange for the shareholders' interest, to pay interest and provide for the redemption of that amount of stock in sixty years, they would require to set aside £12,887 annually; and he was convinced their surplus revenue from the water-works would provide this sum for them. But let the Corporation do as the Water Company proposed to do—viz., raise fresh capital, and undertake the supply of outlying districts (the most remunerative section, as a rule, of any water-works undertaking); and instead of having to go to the municipal rates for assistance, they would be able to reduce the water-rates. Any revenue earned on this amount beyond $3\frac{3}{8}$ per cent. per annum—the amount required to liquidate debt and inherit in sixty years—would be clear profit, available for the reduction of charges or the formation of a reserve fund. In 1876 the Company increased their capital by the sum of £60,000. On one-third of that amount, they were now paying a 5 per cent. dividend; and on the remaining two-thirds, $6\frac{1}{4}$ per cent. Not only were they doing this, but, in addition to paying a 9 per cent. dividend on the original shares, they had set aside a surplus of £6965. Why should not the Corporation do as well in operating with increased capital? In conclusion, he reminded his fellow-ratepayers that the profit earned by the Company at their expense during the year ending June last was equivalent to a rate of 1s. in the pound; the water-rents being equal to a rate of about 1s. 6d. in the pound.

Alderman WRAGGE complained that Alderman Clayton's statement had not been placed in the hands of the Council before the meeting, and maintained that the members had had no adequate opportunity of considering its details. He therefore moved that it was desirable to adjourn the debate, and for the Committee to report on the terms of the statement, and make any further observations they saw fit.

Alderman DODSWORTH seconded the amendment.

Mr. SHAFTO maintained that delay would jeopardize their position, and that the opponents of the resolution would never be satisfied whatever information was laid before them.

Alderman CLAYTON (after the discussion had continued for nearly three hours) said he would be perfectly satisfied if the Council would simply pass a resolution to oppose the Bill, and leave the settlement of the petition to an adjourned meeting.

This was accepted by the mover of the amendment, and was carried.

The Suggested Acquisition of the London Water-Works by the County Council.—The Lambeth Bath Tax Abolition Committee have unanimously passed the following resolutions: "(1) That, in the opinion of this Committee, the time has arrived when the water supply of the Metropolis should be under the control of some authority representing the people of London. (2) That the support of the Committee be given to the London County Council in passing their Bills for the purchase of the undertakings of the London Water Companies; but that the price to be paid should be determined by (*a*) the capital expenditure of the Companies; (*b*) the cost of renewing the works of the Companies, for which no fund has been provided; and (*c*) the cost of a competing supply."

The Newark Gas Company and the Corporation.—The Directors of the Newark Gas Company have expressed their dissatisfaction with the offer made by the Corporation for the purchase of their undertaking, and state a sum of £63,575 as the amount they would be prepared to accept—the Company to retain the reserve fund, balance in hand, stock-in-trade, and general assets, to enable them to clear all liabilities. As this sum, however, is about £12,000 in excess of their offer, the Corporation are of opinion it would be as well to consider what course they should pursue, with a view to opposing the Company's Provisional Order and adopting the electric light. If the Council persist in their intention, there will, it is said, be upwards of £1000 a year deducted from the net income of the Company.

The Little Don Water Schemes.—At the meeting of the West Riding Rivers Board last Wednesday, the Chairman (Mr. C. Milnes Gaskell) proposed a resolution to the effect that, unless clauses in protection of the interests of the Rivers Board and of the inhabitants of the West Riding to the satisfaction of the Finance and Parliamentary Committee be inserted in the Barnsley Corporation (Water) Bill, the Dewsbury and Heckmondwike (Water) Bill, and the Rotherham Corporation Bill, a petition be presented in Parliament praying to be heard against these Bills. Perhaps the most important of these, the Chairman said, was the Barnsley Bill, in regard to which the Committee felt it was a very serious thing indeed that the provision for continuous compensation should be passed over by the Barnsley authorities after the principle had been obtained by the West Riding County Council. The Mayor of Sheffield asked what were the interests of the Riding in obtaining a continuous discharge of compensation water? The Clerk replied that it was to prevent a stream becoming dry, as was frequently the case under the old Act. After some discussion, the resolution was passed.

The Proposed Purchase of the Bridlington Water-Works by the Local Authority.—The Bridlington Urban District Council had a prolonged discussion last Tuesday on the Bill which has been deposited in Parliament by the local Water Company and a proposal to acquire their works. At a previous meeting, it was decided to oppose the Bill, and to seek the insertion of several additional clauses and make certain other alterations—the most important being a clause to enable the Council to purchase the concern when they felt so inclined. A Committee then appointed reported on Tuesday that they had had an interview with the Directors of the Company; and they had consented to insert the suggested clauses. The Committee now recommended that, on the Company giving an undertaking that these clauses would be inserted, the Council should not actively oppose the Bill. The Committee were of opinion that the Council were not now in so good a position to purchase as they would be in 1897, when some of the loans now running would expire. The confirmation of the report having been moved and seconded, Mr. Bradford urged the Council to purchase the works at once, and moved an amendment to that effect. This, however, was not seconded, and the original motion was adopted.

Lancaster Town Councillors on the Prepayment Meter System.—There was an interesting discussion at last Wednesday'smeeting of the Lancaster Town Council on the question of the adoption of the prepayment gas-meter system. It appeared from the minutes of the Gas Committee that the Manager of the gas-works (Mr. C. Armitage) had submitted a favourable report upon the subject; and the Committee, in consequence, recommended that the Department should launch out in this new direction. The confirmation of the minutes was moved by Mr. Helme, and seconded by Mr. Bowness. This gentleman expressed his pleasure that the Committee were going to try the prepayment meter system, as he thought it would be a means of preventing the Corporation from blundering by prosecuting poor people for non-payment of their gas accounts. This was, he said, the greatest mistake the Committee had perpetrated for some time; for, in addition to people being poor, it was a great hardship that they should be hauled before the Court because they were not able to pay their accounts. The prosecution of such people had cost a lot of money for the recovery of a few shillings. He had been told that upwards of 200 customers had ceased taking the gas in consequence of the arbitrary proceedings that had been instituted. The Gas Committee might have the law on their side; but it was not always judicious to put it into operation. Speaking of the number of cubic feet of gas to be delivered for 1d.—a point which has not yet been definitely settled by the Committee—Alderman Smith remarked that the collection of the pennies caused considerable trouble and expense; and therefore he thought 20 feet for 1d. (or 4s. 2d. per 1000 feet) would be a safe figure. Replying to a question, Mr. Helme stated that the cost of the prepayment meters would be £1 each in excess of the ordinary ones: and it was proposed to pay for them out of revenue. Further discussion followed; and, at the close, the minutes were confirmed.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A very gratifying increase of business during the current year was reported at the meeting of the Edinburgh and Leith Gas Commissioners on Monday. In the month of December alone, there was an increase over the output of gas in the same month of 1893 of 10¼ million cubic feet. Between May 16 and Dec. 31, the total output of gas was 840¼ million cubic feet; and the increase over the corresponding period of 1893, was nearly 37½ million cubic feet. In December there was a yield of gas per ton of coal of over 10,500 cubic feet; and the illuminating power of the gas supplied from the Edinburgh works was 26·50 candles, and from the Leith works 25·35 candles. Some of the members of the Commission were anxious to know whether the increase could be accounted for; and one suggested that the recent resolution of the Town Council to burn the whole of the street-lamps all night, instead of extinguishing half of them at midnight, might have something to do with it. It was stated that a rough estimate had been made of the increased quantity of gas which is likely to be consumed; and that it would be, up to the present time, somewhere about 3 million cubic feet. A report on the whole subject was promised. I should say it will be found that two reasons have conduced to the increase of the output—the rapid extension of the city, and the fact that the Commissioners at the end of September last reduced the price of gas from 3s. 6d. to 3s. 2d. per 1000 cubic feet. It was reported that, in consequence of the reconstruction of the North Bridge, the North British Railway Company had undertaken, at their own cost, to make an extensive deviation of the gas-mains in the district. This, it is considered, will be of advantage to the Commission, as the new mains will be larger than those which are to be superseded. A letter from the Convener of the Edinburgh Corporation Electric Light Committee, on the subject of leakage from gas-mains, was sent to a Committee to consider. In connection with it, the Lord Provost delivered a short homily upon the duty of the gas and electric lighting departments working harmoniously together, and giving assistance to each other. This was not altogether called for, as there is no evidence of the one seeking to obstruct the other in any way. I suppose the Electric Light Committee have taken alarm at the frequency of explosions in other towns in electric light culverts, and are anxious that, while the Edinburgh installation is being put down, every care should be exercised to make such occurrences impossible in the city, which is certainly reasonable.

The Gas Committee of the Glasgow Corporation have been in the market for a supply of coal for six months from now; and they have just concluded contracts for about a quarter of a million tons of cannel and splint, at prices of from 6s. 6d. to 6s. 10d. per ton. This is from 3d. to 6d. higher than the rates agreed to in 1893, but as compared with last year—when, owing to trouble with the miners, the prices were unusually high—there will be a saving of about 2s. 6d. per ton. It is reported that the contracts have been more widely distributed than has sometimes been the case, the Committee having been, in that way, able to successfully meet attempts to force up prices, which they, as well as others, have suffered from.

Yesterday, it is reported, there was another gas-poisoning case in Glasgow, but happily without serious consequences. A widow and her six children suffered all day from sickness and vomiting; but they did not attribute their illness to the inhaling of gas. A leak was, however, found in a gas-main near the door to the house; and on it being repaired, the inmates of the house recovered. No gas is used in the house, which, as in nearly every similar case, is in one of the poorest localities of the city. The scene was Cumberland Street, Calton; and the occurrence is the first which has taken place in what is known as the south side of the city—all the others having been in the north, with one exception, which was in the east end.

The end of the Falkirk gas transfer came to-day, in quietness which contrasted strongly with the asperities of the past few months. There were two scenes, each of them equally tame. Within the gas-works at Falkirk, Mr. A. MacPherson, of Kirkcaldy, and Mr. Thomas Wilson, of Coatbridge, went through the rather humdrum operation of taking stock of the materials on hand, and at noon reading the station meter. The undertaking, with all about it, then passed into the hands of the Corporation; and the Company awaits dissolution. The other scene was in the Court of Session at Edinburgh, where Counsel appeared before Lord Low, and formally took out of Court the actions which had been raised by the Corporation against Mr. Barr, of Glasgow, acting as Oversman in the arbitration. As is well known, the arbitration went on without an Oversman; and the whole affair being at an end, there was no need to keep the actions any longer in existence. In withdrawing them, the Corporation, of course, pay the expenses of the Gas Company. Regrets are not unknown in connection with the business. One professional gentleman expressed to me his disappointment that such a good affair should have come to so early an end; while a gentleman who acted in the Corporation interest at the arbitration, confided to me that he rather thought they would have done better if they had accepted Mr. Barr. I should think they would; and the above remarks confirm me in the views I have all along expressed, as to the undesirability of all the litigation which took place. It is now all past; and the Commissioners of Falkirk have an opportunity of showing what their capacity is for managing a public undertaking. Their first piece of management is to be a banquet in a small way, in the Burgh Buildings, on Monday afternoon—to congratulate each other on their good fortune, or to condole with each other on their poor luck, which? From the fact that it is to be a banquet, I rather surmise that, notwithstanding the high price they have paid for the gas undertaking, they are quite pleased, and that we may expect some flowery talk on Monday. On Monday of this week, the account of the Gas Company of their costs in the arbitration was before the Auditor of the Court of Session. It was not a flea-bite; amounting, for Counsel and witnesses, and I suppose Mr. Corbet Woodall's fee as Arbitrator, to £2468. This the Auditor ruthlessly cut down to nearly one-half, which means that if the Gas Company have paid fees which are larger than usual, they must bear the difference out of their own exchequer. They can easily afford to do that. The Gas Commissioners met on Monday; and the Clerk reported the result of the taxing of the Company's expenses, at which the Commissioners were highly pleased. Most of their time was spent on Monday night making arrangements for floating £90,000 of Corporation stock, to meet the cost of the gas undertaking. It is to bear 3 per cent. interest; and they expect to get from £3 to £5 premium. The Edinburgh Corporation got £8 upon stock recently created by them for general purposes; but there is a difference, in more ways than one, between the two cases. I suppose that it was with an eye to the premium that the Commissioners resolved that in the meantime the price of gas should be continued at 4s. 2d. per 1000 cubic feet. To be sure, it is quite right that they should have some time to find out their true position before they interfere with prices; but my recollection goes back to a month ago, when they put forward witness after witness to inform the Arbitrators that 4s. 2d. was an excessive price to the extent of from 6d. to 8d., and could not be maintained. The sooner, therefore, they show that they were in earnest when they sought to make that contention out, the better it will be for their reputation.

The Forfar Gas Corporation have not come up to the necessity of the situation. On Monday night, they met to consider the report of Mr. A. Wilson, of Dawsholm, Glasgow, as to the proposed improvements and extensions of the gas-works; but, instead of doing all that he recommended—which would have cost between £4000 and £5000—they resolved to do only a part meantime, at an outlay of between £1300 and £1400. The parts to be done are the reconstruction of the retort-bench and the extension of the purifiers. A new gasholder, though very much required, and the light railway suggested by Mr. Wilson, are to be left out. So convinced was the Gas Manager (Mr. F. Waddell) of the benefit which the whole scheme would have been, that he offered to relinquish £100 of his salary, and to take it out of the saving above £700 a year which would be effected. The offer was not accepted, which was right; but it also failed to convince the Commissioners. Perhaps when they see the good work done by the portion which they have sanctioned, they may be induced to allow the whole to be gone on with.

A new coalfield is about to be opened up near Lochgelly, in Fifeshire, from which it is expected that about 300,000 tons of coal a year will be got. There are nine seams of coal in the field, among which are the Dunfermline splint, at a depth of 220 fathoms, and the Lochgelly splint, at a depth of 170 fathoms. It is proposed to work the latter only, in the meantime.

Notwithstanding Lord Kelvin's competing electric light installation, the Coatbridge Gas Company, whose half-yearly report was noticed last week, have paid the maximum dividends of 10 and 7 per cent. for the past year.

The Moffat Gas Company have paid a dividend at the rate of 5 per cent. on their ordinary stock, and 7½ per cent. on their guaranteed stock, for the past year; the same as was paid by them a year ago.

The death is announced of Mr. Daniel M'Kennzie, of Perth, who was the first Convener of the Works Committee of the Perth Gas Commission after it was created in 1872, and who did much, during the seven years he held office, to improve the condition of the gas-works.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 2.

Sulphate of Ammonia.—There is less activity than a week ago; and various reasons are put forward for the easier feeling which pervades the market. Some ascribe it to the severe weather on the Continent and elsewhere checking transport, &c.; while others consider that the position of nitrate is exercising an unfavourable influence on the minds of consumers. Concerning the latter commodity, there is a visible supply of some 100,000 tons available for the season in excess of the figures this time last year. But, against this, it must be borne in mind that the value to-day is 10s. per ton less—being 8s. 9d., as against 9s. 3d.; while rather lower prices are quoted for later delivery. It may be on this account that sulphate buyers delay their purchases, thinking to find a more favourable opportunity by so doing; but any possible depression seems to be in the hands of makers, as to the manner in which they dispose of ready parcels. The closing quotations are £11 7s. 6d. Hull and Leith, and £11 8s. 9d. Liverpool.

LONDON, *Feb.* 2.

Tar Products.—There is a better feeling in regard to pitch. Makers have very little stock, and the season's production is likely to be considerably less than was anticipated. There are now buyers for early delivery at 34s. to 35s. per ton; while for next season's delivery sales might be effected at 2s. to 3s. below this price. Carbolic acid has maintained the improved prices. Benzols are languid; but there are buyers at the prices named below. A little more inquiry has come into the market for creosote; and it looks as if this product would see better prices in the spring. Prices are as follows: Tar, 17s. 6d. to 21s. 6d. Pitch, 34s. to 35s. prompt; 32s. forward. Benzols, 50's and 90's, 1s. Solvent naphtha, 1s. 2½d. Toluol, 1s. 3d. Crude (30 per cent.) naphtha, 4⅜d. Creosote, liquid, 2⅛d.; ordinary, 1½d.; salts, 18s.; pressed, 40s. Cresylic acid, nominal, 1s. Carbolic acid, 60's, 1s. 9d. Anthracene, "A," 1s. 1d.; "B," 10¼d.

Sulphate of Ammonia is easier; the business during the week having been done at prices downwards from £11 10s. to £11 5s., less 3½ per cent., all ports. Gas liquor is offered at 7s. 6d. to 9s. 6d. per ton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The position remains very much as reported for several weeks past; the continued severe weather keeping up a fairly active demand for house-fire purposes, which to some extent relieves the market of the pressure of surplus supplies of ordinary round coal, and gives a steady tone to prices. The inferior qualities of round coal do not, however, meet with any improved

demand for iron making, steam, and general manufacturing purposes; and these remain very low in price, with supplies largely in excess of requirements. Engine classes of fuel are perhaps moving off more readily than has been the case recently, which to some extent is due to the fact that very few pits are working more than four to five days per week, thus restricting the output of slack, while requirements for mill consumption are considerably enlarged with the colder weather, and the chemical trade seems to be in a somewhat better position. The result is that supplies are just now in no way excessive; collieries generally readily moving off their present output, particularly in the better qualities. At the pit mouth, best Wigan Arley coals do not average more than 10s. 6d. to 11s. per ton; Pemberton four-feet and seconds Arley, 9s. 6d. to 10s.; common house-fire qualities, 7s. 6d. to 8s.; steam and forge coals, 6s. 6d.; better qualities of slack, 4s. 6d. to 5s.; and ordinary common qualities of slack, about 3s. 6d. Shipping continues quiet, with common coal for steam purposes not averaging more than 8s. to 8s. 3d. per ton, delivered at the ports on the Mersey.

Northern Coal Trade.—There has been a very great difference in the condition of the coal trade in the two parts of the district during the last few days. The steam coal trade has been very greatly depressed; and a number of the collieries have been working short time. On the other hand, the demand has been enlarged for both gas and household coals; and though there were considerable stocks on hand in many cases, yet there has been the need for larger deliveries, especially to local users. Best Northumbrian steam coals have been quoted as low as 8s. 9d. per ton f.o.b., to attract trade. This, however, is only for cases where prompt delivery has been possible; and for delivery over the season, about 9s. 6d. per ton is generally asked. Second-class steam coals are quoted from 8s. to 8s. 6d. per ton; and small steam coals are rather more irregular in price—from 2s. 6d. to 3s. 3d. being asked. Manufacturing coals are still abundant; but the restarting of some of the chemical factories have increased the demand. In regard to the gas coal trade, the deliveries continue large. Prices are weak; and it seems to be expected that, for some contracts for export, there will be keen competition with shippers from other parts. Quotations here are still maintained at 7s. 3d. to 7s. 9d. per ton f.o.b., for best Durham gas coal. The coke trade is very dull, with limited exports. Gas coke is in large production; and the exports are considerable.

Scotch Coal Trade.—The Scotch coal trade does not improve. Almost the only demand is for ell coal for domestic use, and coal for gas purposes; there being several inquiries for contracts in connection with the latter. Prices are a good deal lower than they were last year. Work at the pits is very irregular; and stocking is taking place, which betokens lower rather than higher prices. There is not much inquiry for shipping purposes. The prices quoted are: Main, 6s. 3d. per ton f.o.b. Glasgow; ell, 7s. to 7s. 3d.; splint, 6s. 9d. to 7s.; and steam, 7s. 9d. to 8s. Shipments for the week amounted to 84,005 tons—a decrease upon the quantity in the preceding week of 29,225 tons, and as compared with the corresponding week of last year of 55,896 tons. For the year to date, the total shipments have been 358,397 tons—a decrease upon the quantity in the same period of last year of 167,047 tons.

A Correction.—In the paragraph in the JOURNAL for the 8th ult. (p. 89), referring to the companies which passed out of existence in the year 1894, it was stated that the South Essex Gas and Water Company had been wound up voluntarily, It should be pointed out that the Company referred to was the South-East Essex Gas and Water Company, Limited, in order that it may not be confused with the South Essex Water-Works Company, who are still carrying on business; their office being at Romford.

Reductions in Price.—The Gas Committee of the Dukinfield District Council last week resolved to reduce the price of gas 3d. per 1000 cubic feet; bringing it down to 2s. 11d. The Langley Mill and Heanor Gas Company have reduced the price of gas, as from Christmas last, to the following rates per 1000 cubic feet: Under 20,000 cubic feet, 3s. 6d. per 1000 cubic feet; above 20,000 and under 100,000 cubic feet, 3s. 4d.; above 100,000 and under 200,000 cubic feet, 3s. 2d.; and above this quantity, 3s. It is interesting to note that during the past 20 years the Directors have gradually lowered the price from 6s. to its present figure—a reduction of more than 40 per cent.

The Bodmin Water-Works Company and the Camel Conservators.—A further stage in the protracted dispute between the Camel Fishery Conservators of the Bodmin Water-Works Company was reached last Saturday week. At a meeting of the Conservators on that day, reference was made to the fact that the penalty of £300 imposed by the Magistrates on the Company for not constructing a fish-pass on the river, had not yet been paid over to the Conservators. Mr. Collins, Clerk to the Justices, attended the meeting, and said the Company were certainly in default; and he was prepared to sign a cheque for the £300 which they had paid into Court at the Magistrates' order. It was decided that the cheque should be signed and handed over; the Company being left to make any application to the Magistrates which they might think necessary. A plan submitted by the Company of proposed alterations to the weir which is the subject of dispute was referred to a Committee.

Unaccounted-for Gas at Teignmouth.—At the meeting of the Teignmouth Urban District Council last week, Mr. Banbury called attention to the question of the leakage of gas in the town, and gave notice to move at the next meeting that a special meeting of the Council be called to consider the question of the provision of new gas-mains throughout the district. The value of the gas lost amounted to more than £800; and to have such an enormous waste going on year after year was, he considered, nothing short of scandalous. Mr. Harris said he did not know that the amount of waste mentioned by Mr. Banbury was correct, although there was more waste than there should be. They made about 22 million cubic feet of gas in the course of the year; and the leakage was not more than 2 millions. The Chairman (Mr. F. Slocombe) intimated that the Gas Committee had practically decided on the course proposed by Mr. Banbury. On the motion of Mr. Whiteway-Wilkinson, it was agreed that an expert should be called in to examine the gas-works and report on them.

The Compensation to the Officials and Servants of the Accrington Gas and Water Company.—A meeting of the Directors (eight) and a like number of the shareholders of the Accrington Gas and Water Company was held last Saturday week, to consider the allocation of the £5000 granted by the Corporation to the Directors and servants of the Company as compensation for disturbance through the transfer of the undertaking. It was resolved that the Directors should have £3500, including £700 to the Manager (Mr. C. Harrison), and that the balance of £1500 should be divided among all the other servants who have worked for the Company for not less than four years. During their tenure of office, the Directors received £2 per meeting, which amounted to about £52 apiece per annum. They will now have, as compensation, £350 each. A Sub-Committee was appointed to divide *pro ratâ* the £1500 among the servants.

Water Affairs at Leeds.—For the better supply of water to the elevated district of Beeston Hill, the Leeds Corporation Water Committee are now endeavouring to arrange for the construction of a high-level service reservoir near Middleton Wood, capable of storing about 5 million gallons of water. Ever since this neighbourhood began to develop—about six or seven years ago—there have been complaints in regard to the pressure of the water and the quantity available for the increasing population. The present high-level service reservoir is of small capacity, holding only about 56,000 gallons. The projected reservoir, besides being of greater capacity, would have the advantage of being situated some 50 feet higher above the sea-level—about 320 feet altogether. The Committee have also determined to set the law in motion with a view to putting a stop to river pollution, so far as it affects the Corporation water-works in Wharfedale. At their meeting yesterday week, it was stated that from West End, Fewston, down to Dob Park Mill, Norwood, near Otley, there are some 26 cases of pollution, all of them sources of danger, which, it was urged, ought at once to be stopped under the powers now possessed by the Corporation. The Committee accordingly instructed the Town Clerk to institute the necessary proceedings against the responsible persons, in order to get the nuisance abated.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 260.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Pa'd per Share	Clo ing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	11 Oct.	10½	Alliance & Dublin 10 p. c.	10	20–21	..	5 0 0
100,000	10	,,	7½	Do. 7 p. c.	10	13½–14½	..	5 3 5
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	104–106	+1	4 14 4
200,000	5	14 Nov.	6½	Bombay, Limited	5	6¼–6¾	..	4 16 5
40,000	5	,,	6½	Do. New	4	4¾–5	..	5 4 0
380,000	Stck.	15 Aug.	11½	Brentford Consolidated	100	235–240	..	4 15 10
180,000	,,	,,	8½	Do. New	100	187–192	..	4 8 6
220,000	Stck.	28 Sept.	11	Brighton & Hove Original	100	220–225	..	4 17 9
888,500	Stck.	30 Aug.	5	Bristol	100	115–120	..	4 3 4
320,000	20	28 Sept.	11½	British	20	49–50	..	4 10 0
50,000	10	30 Aug.	11½	Bromley, Ordinary 10 p. c.	10	21½–22½	..	5 2 2
51,510	10	,,	8½	Do. 7 p. c.	10	16½–17½	..	4 17 2
328,750	10	14 Nov.	2	Buenos Ayres (New) Limited	10	6–6⅝	..	3 7 6
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	100–103	..	5 16 7
150,000	20	12 July	8	Cagliari, Limited	20	27–28	..	5 14 3
550,000	Stck.	11 Oct.	13	Commercial, Old Stock	100	277–282	..	4 12 2
165,000	,,	,,	10	Do. New do.	100	203–208	..	4 16 2
160,762	,,	13 Dec.	4½	Do. 4½ p. c. Deb. do.	100	130–135	..	3 6 8
800,000	Stck.	13 Dec.	13	Continental Union, Limited.	100	240–215	..	5 6 1
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	205–210	..	4 15 3
535,000	Stck.	30 Aug.	5	Crystal Palace Ord. 5 p. c. Stk	100	117–122	..	4 1 11
486,090	10	31 Jan.	11	European, Limited	10	23–24*	..	4 11 8
351,060	10	,,	11	Do. Partly paid	10	16–17*	+½	4 17 1
5,646,590	Stck.	15 Aug.	12	Gaslight & Coke, A, Ordinary	100	267–272	+5	4 8 3
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	105–110	..	3 12 9
665,000	,,	,,	10	Do. C, D, & E, 10 p.c.Pf.	100	280–285	..	3 10 2
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130–135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	200–205	..	3 13 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	185–190	..	3 13 8
463,000	,,	,,	10	Do. I, 10 p. c. Prf.	100	277–282	+2	3 10 10
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	165–170	..	3 10 7
1,061,150	,,	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	127–130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	135–140	..	3 4 3
908,000	,,	,,	6	Do. 6 p. c. do.	100	188–192	..	3 2 6
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	238–243	+6	4 18 9
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd.	5	5⅝–6	+⅛	5 0 0
560,000	100	1 Oct.	5	Met.of Melbourne, 5 p. c. Deb.	100	110–112	..	4 9 3
541,920	20	14 Nov.	5	Monte Video, Limited	20	15½–16½	..	6 1 2
150,000	5	29 Nov.	8	Oriental, Limited	5	7–7½	..	5 6 8
60,000	5	13 Sept.	7	Ottoman, Limited	5	4¼–4½	..	7 7 4
166,870	10	31 Jan.	2	Para, Limited	10	1⅞–2½	..	8 0 0
420,000	100	2 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	105–109	..	5 10 1
500,000	100	1 Dec.	6	2nd Do.	100	100–105	..	5 14 3
150,000	10	11 Oct.	6	San Paulo, Limited	10	8¾–9½	..	6 6 4
500,000	Stck.	30 Aug.	15½	South Metropolitan, A Stock	100	340–350	+2½	4 8 7
1,350,000	,,	,,	12	Do. B do.	100	295–300	+5	4 0 0
260,000	,,	,,	13	Do. C do.	100	305–315	†	4 2 6
750,000	,,	16 Jan.	5	Do. 5 p. c. Deb. Stk.	100	167–172	..	2 18 2
60,000	Stck.	30 Aug.	11½	Tottenham & Edm'nton, "A"	100	225–230	..	5 0 0
				WATER COMPANIES.				
746,021	Stck.	28 Dec.	10½	Chelsea, Ordinary	100	290–295	..	3 8 8
1,719,514	Stck.	11 Oct.	8	East London, Ordinary	100	235–240	..	3 6 8
654,740	,,	28 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	150–155	..	2 18 0
700,000	50	13 Dec.	8½	Grand Junction	50	122–124	..	3 8 7
708,000	Stck.	15 Aug.	12	Kent	100	307–312	..	3 16 11
1,043,800	100	28 Dec.	9½	Lambeth, 10 p. c. max.	100	270–275	..	3 9 1
406,200	100	,,	7½	Do. 7½ p. c. max.	100	207–212	..	3 11 1
330,000	Stck.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	135–138	..	2 17 11
500,000	100	15 Aug.	12½	New River, New Shares	100	393–398	..	3 0 11
1,000,000	Stck.	31 Jan.	4	Do. 4 p. c. Deb. Stk.	100	140–145*	+2	2 15 2
902,300	Stck.	13 Dec.	6	S'thwk & V'xhall, 10 p.c. max.	100	170–174	..	3 9 0
126,500	100	,,	6	Do. D 7½ p.c. do.	100	160–165	..	3 12 9
1,155,066	Stck.	13 Dec.	10	West Middlesex	100	280–285	+2	3 10 2

*Ex div.

† Rise in week, 12½.

GWYNNE & BEALE'S
PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

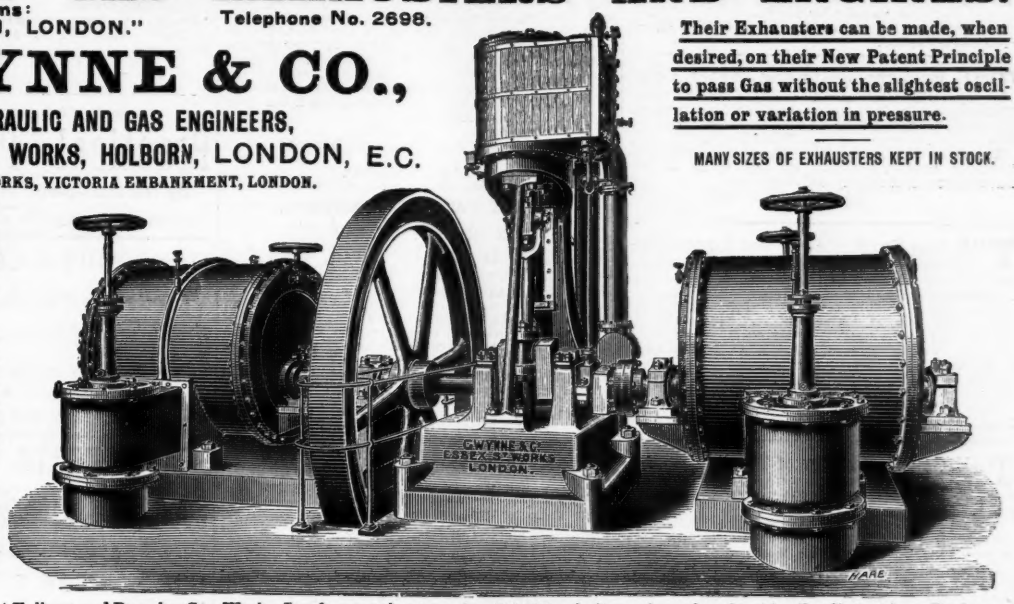
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM, PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.

ANDREW STEPHENSON, 182, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.

Telegrams: "Volcanism, London."

AMMONIACAL LIQUOR Wanted. BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted. BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted. BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO. Offices: Commercial Buildings, LEEDS. Correspondence invited.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c. Head Office: MIDDLESBROUGH. Correspondence invited.

HAMBURG (GERMANY), ED. ZIETZ, I. BRANDSTWIETE, 20, COMMISSION BUSINESS,

AGENT for the Deutsche Gasglühlicht Akt. Ges. Berlin, offers his services FOR THE SALE OF LIGHTING AND HEATING APPARATUS of every description; also of any Patent Novelties. Business connections with all Countries. Correspondence in all modern Languages.

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. III., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham. First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c. Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER. Telegrams: "ENAMEL." National Telephone 1759.

GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER. For all Joints in connection with Oil-Gas Plant and Sulphate Plant. For all Gas Joints. For all Tar Joints. For all Ammonia Joints.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application. 70, CHANCERY LANE, LONDON, W.C.

AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description. Please write for Estimate before ordering elsewhere.

SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

WANTED, a Chief Engineer of this Company. Salary to commence with £600 per annum. Applications, stating Experience and Antecedents, and containing Testimonials, to be sent to the SECRETARY, at the Office of the Company, Paradise Street, BIRMINGHAM, not later than Twelve o'clock at noon, of Feb. 19, 1895.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. Sample and Price on application. OXIDE PAINTS, OILS, SULPHURIC ACID, &c. 120 and 121, NEWGATE STREET, LONDON, E.C. Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c. Telegraphic Address: "PORTER LINCOLN."

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron. Two or three times as rich as Bog Ore. Strong action on Sulphuretted Hydrogen. To be used alone, but will increase activity of other Oxides. Less than half the price of Bog Ore. Can be lent on hire. Write for tabulated results. READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

In Paper Covers, Post Free, Price 2s.

S. CARPENTER on the Purification of COAL GAS from CARBONIC ACID and the SULPHUR COMPOUNDS by LIME, OXIDE OF IRON, and ATMOSPHERIC AIR. S. & H. W. CARPENTER, 3, Bedford Villas, Carshalton, SURREY.

WANTED, Persons with connection to CALL ON GAS COMPANIES for the Sale of Article in daily use. State, by letter, Locality and Remuneration expected to No. 2477, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN.

WANTED, in a large Provincial Gas-Works, a competent DRAUGHTSMAN. Preference will be given to one with a knowledge of Machinery. Address, stating Age, Qualifications, present Occupation, and Salary required, to No. 2473, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a thoroughly competent and experienced TRAVELLER for the Midland Gas and Steam Coal Trade. One having a good connection would be liberally dealt with.

Address No. 2476, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Hartlepool Gas and Water Company will shortly have FOR SALE one STATION METER, by Milne & Son (capacity, 60,000 feet per hour); also two EXHAUSTERS and ENGINES combined, by Waller & Co. (capacity of each, 25,000 feet per hour).

The above may be seen at work, or any further information thereon obtained on application to Mr. Thomas Bower, the Company's Engineer.

THOMAS TREWHITT,
Secretary.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the supply of a LANCASHIRE BOILER, 30 feet long by 8 feet diameter, for the Gas-Works, Meadow Lane.

Plans and Specification may be seen, and further Particulars obtained, on application to Mr. Easton, Gas Stores Department, 21, Dewsbury Road, Leeds.

Tenders will be received, addressed to the Chairman of the Gas Committee, Municipal Offices, Leeds, not later than Wednesday, the 20th inst., endorsed "Tender for Boiler."

The Committee do not bind themselves to accept the lowest or any tender.

THE Gas Committee of the Leeds Corporation Solicit TENDERS for the supply of FIRE-CLAY RETORTS, FIRE-BRICK LUMPS, FIRE-BRICKS, and FIRE-CLAY.

Particulars as to quantity, with Form of Tender, may be had on application, at the Offices of the Gas Department, Municipal Offices, Leeds.

Tenders, addressed to the Chairman at the address as above, will be received not later than Wednesday, the 20th inst., endorsed "Tender for Fire Goods."

The lowest or any tender will not necessarily be accepted.

SLOUGH GAS AND COKE COMPANY.

THE Directors are prepared to receive TENDERS for a new or second-hand WASHER (Good's preferred). Capacity, 300,000 cubic feet per day.

Particulars may be had on application to Mr. T. Webb, the Manager at the Works, Slough.

Tenders, addressed to the Chairman, R. Martin, Esq., Castleview, Chalvey, near Slough, endorsed "Tender for Washer," to be delivered on or before Tuesday, the 12th of February.

The Directors do not bind themselves to accept the lowest or any tender.

ARTHUR THOMAS,
Secretary.

Jan. 31, 1895.

COUNTY BOROUGH OF SALFORD,
(GAS DEPARTMENT.)

RETORTS AND FIRE-BRICKS.

THE Gas Committee invite Tenders for the supply of RETORTS and FIRE-BRICKS required at their various Works.

Full Particulars and Forms of Tender may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Fire-Clay Goods," addressed to the Chairman of the Gas Committee, to be sent to me not later than Five p.m., on Thursday, the 21st inst.

By order,
SAML. BROWN,
Town Clerk.

Town Hall, Salford,
Feb. 2, 1895.

ISLE OF THANET GAS COMPANY.

SULPHATE OF AMMONIA.

THE Directors of the above Company are prepared to receive TENDERS for about 50 Tons of SULPHATE OF AMMONIA for delivery between Feb. 15 and 26 next.

For Samples and Conditions of Sale and Delivery apply to the Engineer, Mr. H. H. Jones.

Tenders to be sent in on or before Thursday, Feb. 14, addressed to the Chairman of the Company, and endorsed "Tender for Sulphate."

The Directors do not bind themselves to accept the highest or any tender.

By order,
THOS. C. FULLER,
Secretary.

Gas-Works, The Dane, Margate,
Feb. 1, 1895.

CHESHUNT URBAN DISTRICT COUNCIL.

TO GAS ENGINEERS.

THE Cheshunt Urban District Council are prepared to receive TENDERS from Gas Engineers for the supply and fixing of a LETHEBY-BUNSEN PHOTOMETER.

Specification may be seen or obtained at the Office of the Engineer to the Council, Mr. S. Towlson, Assoc.M.Inst.C.E., Turner's Hill, Cheshunt.

Tenders to be sent in, addressed to the Chairman, Urban District Council, St. Mary's Hall, Cheshunt, Herts, not later than Four p.m., on Monday, the 11th day of February, 1895, endorsed "Tender for Photometer."

The Board do not bind themselves to accept any tender.

A. COLLINGWOOD LEE,
Solicitor, Clerk to the Council.

St. Mary's Hall, Cheshunt,
Jan. 31, 1895.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the Directors of the above Company intend to offer FOR SALE by Public Auction at the Mart, Tokenhouse Yard, in the City of London, on Tuesday, the 12th day of March next, at Two o'clock in the afternoon precisely, £20,000 (being the third portion) of "C" STOCK, in the following lots: 150 of £100 each, and 100 of £50 each, issued under the powers of the Tottenham and Edmonton Gas Act, 1882.

By order,
JAMES RANDALL,
Secretary.

Dated this 1st day of February, 1895.

COLNEY HATCH GAS COMPANY.

NOTICE OF GENERAL MEETING.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, New Southgate, on Thursday, the 14th of February next, at Six o'clock in the Evening precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1894, to declare Dividends, to elect Directors, to appoint an Auditor, and for other purposes.

By order,
ERNEST L. BURTON,
Secretary *pro tem.*

Jan. 29, 1895.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 22nd day of February, 1895, at Three o'clock precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ending the 31st of December last, to declare a Dividend, to elect two Directors and one Auditor retiring by rotation, and for General Purposes.

The Transfer Books will be closed from the 7th day of February until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works: Lower Sydenham, S.E.,
Feb. 4, 1895.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Proprietors of the above Company will be held at the Company's Offices, North Street, Wandsworth, on Thursday, the 21st of February inst., at Five o'clock in the Evening precisely, for the purpose of a declaration of a Dividend, the election of Directors and an Auditor, and the transaction of the General Business of the Company.

The Transfer Books will be closed on and from the 8th until the 21st of February, both days inclusive.

By order of the Board,
WALTER CROMARTY,
Secretary.

North Street, Wandsworth, S.W.,
Feb. 1, 1895.

MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY.

INCORPORATED BY ACT OF PARLIAMENT, 1867.

NOTICE is Hereby Given, that the FIFTY-SIXTH ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of this Company will be held in the Board-Room, at the Works, Mitcham, in the County of Surrey, on Tuesday, the 19th day of February, 1895, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and a Statement of the Accounts for the Half-Year ended the 31st day of December last, to declare a Dividend, to elect Directors and an Auditor in place of those retiring by rotation, and for General Business.

The Transfer Books will be closed from the 4th inst. until after the meeting.

By order,
BENJAMIN GREEN,
Secretary and Manager.

Offices and Works: Western Road,
Mitcham, Feb. 2, 1895.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

MESSRS. CLAPHAM BROS., Limited, Keighley, Yorkshire, are no longer authorized to Manufacture my CONDENSER and WASHER-SCRUBBERS.

The above-named Gas Apparatus are erected and giving entire satisfaction at the following places: Neath, Lincoln, Sheffield, Ellesmere, Mountain Ash, Malden, Cullingworth, Montreal (Canada), Woodstock (South Africa), Cape Town (South Africa), &c.

These Appliances can now be obtained solely of the undersigned.

Winchester House, London, E.C. J. A. KELMAN.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

CLAPHAM BROS., LIMITED, of Keighley, Yorks., beg to intimate that they are the SOLE MAKERS of LAYCOCK & CLAPHAM'S "ECLIPSE" WASHER-SCRUBBER, and that no person or persons beyond the Patentees and Makers have ever had any interest whatever in the Patent.

They are also the SOLE MAKERS of CLAPHAM'S PATENT IMPROVED "ECLIPSE" CONDENSER, as supplied to Bradford, Manchester, and other Gas-Works.

Orders and Inquiries promptly attended to. See advertisement in this week's JOURNAL, p. 292.

THE Forfar Gas Corporation invite TENDERS for BRICKWORK of Retort Bench and Settings; also for BENCH MOUNTINGS, PURIFIER-COVERS, &c.

Plans, &c., from subscriber on payment of ten shillings, which will be returned on receipt of *bonâ fide* tender.

FORBES WADDELL,
Manager.

Fcap. 4to, Cloth, price 7s. 6d., post free.

Practical Photometry.

By William Joseph Dibdin, F.I.C., F.C.S.

LONDON: WALTER KING, 11, Bolt Court, FLEET STREET.

HARCOURT'S COLOUR TEST.

For Carbon Bisulphide, Sulphuretted Hydrogen, and Carbonic Acid in Coal Gas.

The Materials for the above Tests may be obtained from

Mr. S. E. MILLER, 115, Cowley Road, Oxford.

GAS-RETORTS. FIRE-BRICKS.

Société de Produits Réfractaires

DE SAINT-GHISLAIN (BELGIUM).

LUMPS, TILES, FIRE-CEMENT, &c.

EXPORTATION *via* ANTWERP.

REGENERATIVE GAS-FURNACES—PRINCIPE DE BROUWER.

HEATHCOTE GAS COAL.

Rich in Illuminating Power & Yield of Gas.

Above the average in Weight & Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR Co., Ld.,

CHESTERFIELD.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS:—

Yield of Gas Per Ton . .	11,205 Cubic Feet.
Illuminating Power,	$16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality)	$13\frac{3}{4}$ Cwt. Per Ton.
Sulphur	A little over 1 Per Cent.
Ash	Under 1 Per Cent.
Tar	163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor	103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE, 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . .	10,500 Cubic Feet.
Illuminating Power .	17 Stand. Sperm Candl.
Coke (of excellent quality) .	$13\frac{1}{2}$ Cwt. Per Ton.
Sulphur	1·13 Per Cent.
Ash.	1·34 Per Cent.
Tar	180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor	$94\frac{1}{2}$ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. Price, Inventor and Patentee, 22, Alwyne Road, Canonbury, London, N.

Prices are Reduced.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

KENT'S THICK GAS COAL

RAISED AT

The Wharncliffe Woodmoor Colliery,

BARNSLEY.

Yield of Gas, nearly 12,000 *Cubic Feet per ton of Coal; and Illuminating Power, nearly* 17½ *Candles.*

The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham:—

Specific Gravity (Water 1) . .	1·276
Weight of One Cubic Foot . .	79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal	2·68 per cent.
Volatile Matter	35·60 ,,
Fixed Carbon	58·80 ,,
Sulphur	0·96 ,,
Ash	1·96 ,,

COMMERCIAL ANALYSIS.

Gas per Ton of Coal	11,760 cub. feet.
Gas per Cubic Foot of Coal .	418 ,,
Illuminating Power	17·44 candles.
Value of One Cubic Foot in Sperm	418 grains.
Value per Ton of Coal in Sperm	703 lbs.
Coke per Ton of Coal . . .	1367 ,,
Coke	61·05 per cent.
Ash in Coke	3·21 ,,
Sulphur Eliminated with Volatile Products per Ton of Coal	9·4 lbs.
Sulphur in Coke per Ton of Coal	12 ,,
Ammoniacal Liquor per Ton of Coal	19·7 galls.
Tar per Ton of Coal	12·2 ,,

R. O. PATERSON, C.E.

Gas-Works, Cheltenham,
8th August, 1894.

For Price, &c., apply to

THE

Wharncliffe Woodmoor Colliery Co

LIMITED,

BARNSLEY.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Bombay Gas Company, San Paulo Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,
Fitter.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

Shipments Promptly and Carefully Executed.

ALEXANDER CAMERON,

CANNEL & GAS COAL MERCHANT,

48, WEST REGENT STREET,

GLASGOW.

ARMSTRONG'S

PATENT

CANDLE SAFETY LAMPS.

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

48, Manchester Street, Gray's Inn Road, W.C.

THORNLEY GAS COALS

Worked by the

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

Tudhoe and Sunderland Bridge Gas Company.
Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

Gentlemen,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.
The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. Cowan,
Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Work
(also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,
for
CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	15·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

THE DRUM
FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.
See Advertisement in last and next issue.

T. B. KITTEL, SHEFFIELD.
CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
ENGLISH & SCOTCH CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON APPLICATION.
T. B. KITTEL, SHEFFIELD.

TAR AND LIQUOR PURCHASED.
JOHN CLARKSON MAJOR,
(Established 1851,)
Tar Distiller and Manufacturing Chemist,
WOLVERHAMPTON.

SULPHATE OF AMMONIA SATURATORS.
JOSEPH TAYLOR & CO.,
Central Plumbing Works, Town Hall Square,
BOLTON.
Practical Makers of all kinds of Saturators, and Specialists in every description of Lead Work required in connection with Sulphate Plants.
Special attention to Repairs.
Improved Lead-Burning Machines,
Sulphate Bagging Machines, Copper Sccops, &c.
HIGHEST REFERENCES ON APPLICATION.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.
Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.
FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

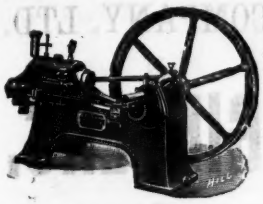
PIPES, 2-in. to 8-in. PIPES, 2-in. to 8-in. PIPES.
MONIER-WILLIAMS & Co.
IRONFOUNDERS,
MIDDLESBROUGH.

ALDER AND MACKAY,
MANUFACTURERS OF
IMPROVED WET AND DRY GAS-METERS
IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.
ORIGINAL MANUFACTURERS OF DRY METERS IN CAST-IRON CASES.
STATION METERS, EXPERIMENTAL METERS, PHOTOMETERS, & PRESSURE-GAUGES, &c.

Results of Tests of Dry Gas-Meters (Section III.) of the Glasgow Philosophical Society's Gas Exhibition, as per London "Gas Journal," May 10, 1881.

	ALDER & MACKAY.	W. & B. COWAN.	G. GLOVER & Co.	JAMES KEITH.	D. B. PEEBLES & Co.
Total of Fast Tests	47·2	6·9	33·6	62·3	53·7
Total of Slow Tests	25·3	117·4	43·1	31·4	38·5
	72·5	124·3	76·7	93·7	92·2

Descriptive Circulars, Price Lists, and Full Particulars forwarded on application.
NEW GRANGE WORKS, EDINBURGH.



DON'T BE PREJUDICED

Because the prices of Monarch Gas-Engines are so low, but if you are wanting, have one on trial, and prove conclusively that they are the best value on the market.

1½-B.H. Power, with Governors, &c., only £28 10s., less liberal terms. Other sizes to 12-H.P. in proportion. Catalogue of Telephones, Bell Speaking-Tubes, Electric Bells, &c., 4d.

W. H. BAUGHAN & CO., CHARLBURY.

OIL GAS

BETTER TERMS CAN BE OBTAINED FROM SUPPLIERS OF OIL IF PURCHASERS HAVE THEIR OWN

TANK-WAGGONS.

HURST, NELSON, & Co., LTD.,

THE GLASGOW ROLLING STOCK AND PLANT WORKS, MOTHERWELL.

REGISTERED OFFICE:

27, ST. VINCENT PLACE, GLASGOW.

PHILADELPHIA EXHIBITION, 1876.

ALSO SILVER MEDAL, PARIS.

The Highest Award for Gas-Retorts and other Goods in Fire-Clay has been awarded to KING BROTHERS for their Goods made from their renowned Stourbridge Fire-Clay.

KING BROTHERS,

Proprietors of

STOURBRIDGE CLAYS,

Manufacturers of

Fire-Bricks, Tank Blocks, Glass-House Bricks and Pots, Gas-Retorts, Crucibles in Clay and Plumbago, Gas-Oven Bricks, Bricks for Regenerator Furnaces and Hot-Air Stoves.

STOURBRIDGE, ENGLAND.

CRUCIBLE MANUFACTORY, 46, PENN STREET, CURZON STREET, BIRMINGHAM.

N.B.—Gas, Blast-Furnace, and Glass-House Bricks and Glass-House Pots always in Stock, or made on the Shortest Notice.

Telegraphic Address: "ROBUSTNESS, London."

ROBUS'

Exchange Telephone No. 1758.

GASEOUS FIRING for Large or Small Settings.

INCLINED RETORT-SETTINGS, with or without Gaseous Firing.

RETORT-SETTINGS of exceptional Merit for Works on Wet Soils.

GASHOLDER TANKS

AND GAS AND WATER WORK, INCLUDING MAIN LAYING.

CONTRACTS Entered into for Retort Work of every kind, and all descriptions of Gas Apparatus. Guarantees given for the efficiency of our Work.

Plans, Specifications, and Estimates, with every Particular.

J. & H. ROBUS,

Gas and Water Contracting Engineers,
20, BUCKLERSBURY, LONDON, E.C.

THE ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LTD.

CARBURETTED WATER GAS ENGINEERS.

"Merrifield-Westcott-Pearson" Setting

GUARANTEED to give BETTER RESULTS than any other Plant in the Market.

London Offices: SUFFOLK HOUSE, LAURENCE POUNTNEY HILL, E.C.

Specialty—**The "CHAMPION" Sulphate of Ammonia Plant.**

WILTON'S PATENT AUTOMATIC SULPHATE DISCHARGER.

Over 50 Apparatus have been fixed within twelve months, giving Universal Satisfaction.

For References, Estimates, &c., apply to

MAURICE SCHWAB,
96, DEANSGATE,
MANCHESTER.

ALFRED WILLIAMS & CO.

[MATTHEW MILDRED]

70, 71, 72, & 73, BANKSIDE,

SOUTHWARK, S.E.

UNIVERSAL PROVIDERS

FOR GAS, WATER, AND SEWAGE WORKS.

ENGINEERS & CONTRACTORS

For the Erection of Complete Gas and Water Works, and for Renewals and Extensions of every description.

Plans and Estimates on Application.

MAIN LAYING AND RETORT SETTING.

WILLEY & CO.

GAS ENGINEERS & CONTRACTORS,

Central Works: Commercial Road, EXETER;

Meter Works: James Street, EXETER.

Telegraphic Address: "WILLEY, EXETER." Telephone No. 132.

Edison-Bell Phonograph Used.

Metropolitan Agent: CAPTAIN ACLAND, M.Inst.M.E., Assoc.M.Inst.C.E., DOCK HOUSE, BILLITER STREET, LONDON.

Manufacturers of every Requisite for Gas-Works.

Specialities: GASHOLDERS, GAS-METERS, GAS-FITTINGS.

WILLEY AND CO. beg to announce that they have recently acquired the Sole Right and Proprietorship of the

"SIMPSON"

Automatic Penny-in-the-Slot Meter

(By Royal Letters Patent).

An application of the "Vernier Principle," ensuring Mathematical Accuracy of Registration, combining all the latest Scientific Improvements

PRICE INSTANTLY, SIMPLY, & READILY ADJUSTED *IN SITU*, BY SINGLE FEET OR HALF FEET, WITHOUT CHANGE OF WHEELS.

STRENGTH, DURABILITY, & MINIMUM SIZE.

AMPLE WARNING & GRADUAL EXTINCTION.

BASE OR MISTAKEN COIN DETECTED & RETURNED.

Terms on Application.

NEW CATALOGUE OF GAS-FITTINGS of novel and registered designs, with Special Quotations to Gas Companies, now in the Press for early circulation.

Agents for the "MAXIM PATENT CARBURETTOR" New Process of Gas Enrichment by Carburine.

THE SILICA FIRE-BRICK COMPANY,

OUGHTYBRIDGE, NEAR SHEFFIELD.

Established 1858. The First Manufactory of Silica and Dinas Fire-Bricks erected in England.

MANUFACTURERS OF

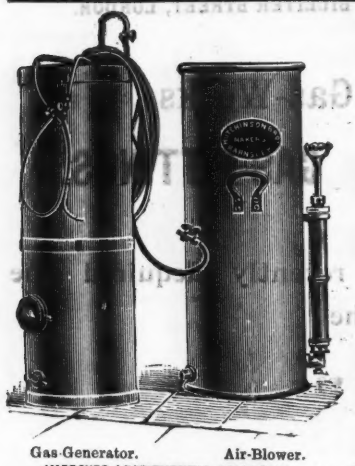
SILICA FIRE-BRICKS

(TRADE MARK "SILICA")

Specially adapted for Siemens-Martin Gas-Furnaces; also for Gas, Copper, Iron, Steel, and other Furnaces where intense heat is required.

BESSEMER GANNISTER, STEEL-FURNACE GANNISTER, COPPER-FURNACE GANNISTER, IRONFOUNDERS' CUPOLA SAND, FINE-SETTING SILICA CEMENT, STEEL MOULDERS' COMPOSITION.

Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.



Gas-Generator. Air-Blower.

IMPROVED LEAD-BURNING APPARATUS.

HUTCHINSON BROS.,

GAS ENGINEERS, &c.

SPECIALITY.

LEAD WORK FOR SULPHATE OF AMMONIA PLANTS,

BEST QUALITY OF MATERIAL AND WORKMANSHIP.

SATURATORS, all Lead, or Strong Sheet Lead, in Wood Casing,

ACID TANKS ELEVATORS, AND COOKS. LIQUOR AND LIME PUMPS OR INJECTORS.

Liquor-Cocks, Gauge Fittings, and Safety-Valves in Cast Iron.

HYDROMETERS, TEST-JARS (GLASS OR LEAD), COPPER SCOOPS, &c., &c.

IMPROVED LEAD-BURNING APPARATUS.

LEAD BURNERS SENT OUT TO REPAIRS.

FALCON WORKS, BARNSLEY.

Telegrams: "HUTCHINSON BROS., BARNSLEY."

SEND ALL YOUR ENQUIRIES

FOR PLANS, SPECIFICATIONS, AND PRICES FOR ANY KIND OF

GAS PLANT

TO

R. DEMPSTER & SONS, LTD.,

ESTABLISHED 1855.

Telegrams: "DEMPSTER, ELLAND."

ELLAND, YORKS.

Our Works cover 9 acres, and are fitted up with Powerful Hydraulic Plant and modern Machinery, by which we are able to supply, at low Prices, the very best Plant that it is possible to make with skilled Workmen and Materials of superior quality. No charge for Estimates.

GASHOLDERS. / TANKS. / CONDENSERS. / EXHAUSTERS. / PUMPS. / SCRUBBERS. / PURIFIERS. / VALVES. / HOPPERS. / ROOFS. / BRIDGES. / WASHERS. / TUBES, &c.

CONSTRUCTION OF COMPLETE GAS-WORKS A SPECIALITY.

ALEX. C. HUMPHREYS, M.E. A. G. GLASGOW, M.E.

TELEGRAPHIC ADDRESS:
"EPISTOLARY LONDON."

HUMPHREYS & GLASGOW,

Contracting Engineers for
CARBURETTED WATER GAS PLANT,
9, Victoria Street, London, S.W.

United States Office:
64, Broadway,
New York.

CLAYTON SON & Co, LTD

MAKERS OF

WORKS LEEDS

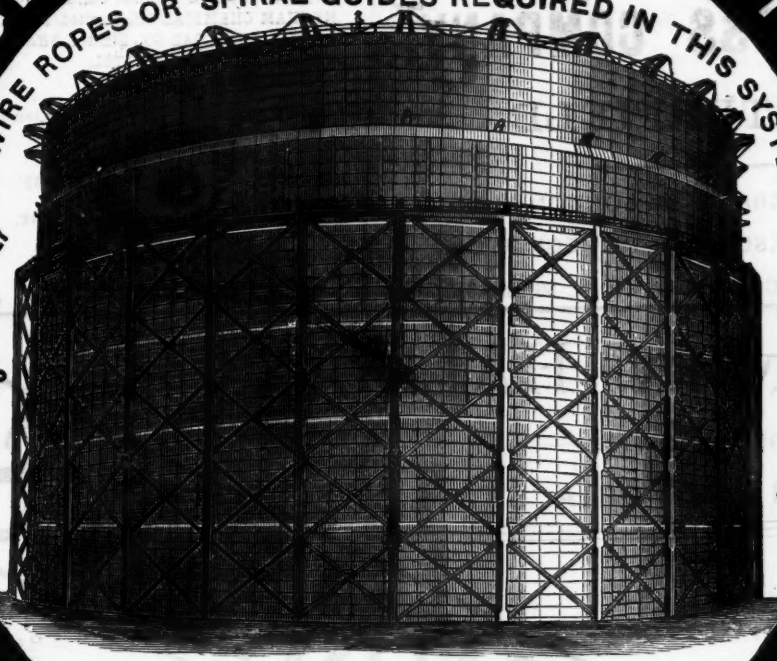
THE LARGEST GASHOLDER IN THE WORLD.

CAPACITY 12 MILLION CUBIC FT.

GASHOLDERS OUR SPECIALITY

NO WIRE ROPES OR SPIRAL GUIDES REQUIRED IN THIS SYSTEM.

INFINITELY SAFER AND FAR LESS COSTLY THAN ROPES OR SPIRAL GUIDES.



ERECTED AT EAST GREENWICH FOR THE South Metropolitan Gas Company
IT HAS SIX LIFTS 30 FT DEEP EACH AND IS 300 FT DIAR.

MAKERS OF GAS PLANT OF EVERY DESCRIPTION
ROOFS PURIFIERS &c. ALSO

ADDRESS LONDON 60, QUEEN VICTORIA ST.
TELEGRAPHIC "GAS, LEEDS."
GASHOLDERS OF ANY SIZE

ERECTED & COMPLETED WITHIN 12 MONTHS AND AT THE TIME SPECIFIED

GAS AND WATER PIPES.

Telegraphic Address: "RITCHIE MIDDLESBROUGH."

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
CXC	"JACKSON"	BECK & Co.,
MARK.	CLAY CROSS.	130, ST. SUFFOLK ST., S.E.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

OVENDEN, HALIFAX.

LONDON OFFICE

60, QUEEN VICTORIA ST., E.C.

Telegraphic Addresses:

"DRAKESON, HALIFAX."
"ECLAIRAGE, LONDON."

Telephone: No. 43.
HALIFAX EXCHANGE.

JONAS DRAKE & SON

GAS ENGINEERS,

CONTRACTORS, IRONFOUNDERS,

RETORT SETTERS, FURNACE BUILDERS, &c., &c.

GASEOUS FIRING A SPECIALTY.

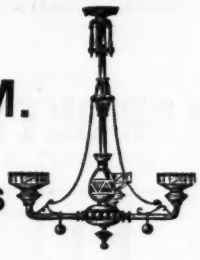
Cloth Bound, Price 3s. 6d., Post Free.

THE ROYAL COMMISSION
ON THE
METROPOLITAN WATER SUPPLY
-1892-3.-

Report of the Evidence (reprinted from the JOURNAL), with comments on the Inquiry, and the Commissioners Conclusions, and Recommendations.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

OSLER,
BIRMINGHAM.
MANUFACTURERS
OF GASELIERS
IN GLASS AND METAL.



WILSON CARTER & PEARSON,
GAS COAL AND CANNEL FACTORS,
Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.
ADDRESS CHIEF OFFICES:
Temple Buildings, 50, New Street, Birmingham.

CROWTHER BROTHERS,
Contractors for the Erection of Gas-Works Complete, RETORT-SETTINGS, Furnace Building, the Erection of Retort-Benches, &c., &c.
N.B.—Special attention given to the Erection of Inclined Retort-Benches on the Generator and Regenerative Principles complete.
MAIN LAYING IN ALL ITS BRANCHES.
For Terms and Particulars, apply to
CROWTHER BROTHERS,
GAS-WORKS, HOLT, Near WREXHAM;
153, ST. LEONARD'S ROAD, POPLAR, LONDON, E.
Telegraphic Address: "GASRETORT, LONDON."
Experienced Retort Setters and Main Layers sent to all Parts on the Shortest Notice.

The Climax of Regenerative Gas Lighting!!

THE
"VERTMARCHE"
A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— 55/-
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England.
HENRY GREENE & SONS,
153 & 155, CANNON STREET,
LONDON BRIDGE, E.C.
PARTICULARS AND PRICES FREE. AGENTS WANTED.

BOWENS' Ltd. Successors,
STOURBRIDGE.
MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.

HARPER & MOORES,
STOURBRIDGE.
MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.
MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1836.

STEEL SCOOPS
FOR
RETORT CHARGING.

Scoops supplied with or without handles, and of any dimensions or shape required.
HENRY SYKES, Engineer,
66, BANKSIDE, LONDON, S.E.

PETTIGREW'S PATENT
Sulphate of Ammonia Plant
ON THE CONTINUOUS SYSTEM
Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.
Old Systems easily and cheaply converted.
ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.
Write for Particulars, Testimonials, and References to
GEO. PETTIGREW & Co.,
GAS AND CHEMICAL ENGINEERS,
MIDDLESBROUGH-ON-TEES.

BEST & LLOYD
MAKERS OF THE BIRMINGHAM.

PATENT "SURPRISE"
PENDANT,
WITH PATENT SHADE.
The ONLY GAS-PENDANT suitable for Domestic Lighting; a room 18 ft. by 14 ft. being beautifully illuminated with one Incandescent Burner.
Extract from the JOURNAL OF GAS LIGHTING, Jan. 8, 1895.
"IN CONJUNCTION WITH
THE INCANDESCENT GAS-LIGHT,
it quite **supersedes** the familiar three-light pendant. We are able to bear witness to the **convenience** of the New Pendant."

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

FOR **TUBES AND FITTINGS** APPLY TO

JOHN BROTHERTON, LTD., IMPERIAL TUBE WORKS, WOLVERHAMPTON.

Telegrams: "IMPERIAL, WOLVERHAMPTON."

MOBBERLEY & PERRY
STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

Contractors for the erection of Retort-Benches complete.

CLAPHAM BROTHERS, LIMITED,

— ESTABLISHED 1837 —

LARGE REPEAT ORDERS

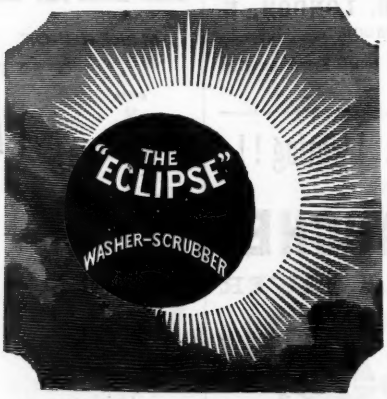
Have been received for

Laycock & Clapham's Patent

"ECLIPSE"

WASHER-SCRUBBERS.

Order Early.



GREAT SUCCESS

OF

Clapham's Patent

"ECLIPSE"

CONDENSER.

SEND FOR PARTICULARS.

CLAPHAM'S IMPROVED VALVES, PURIFIERS, AND RETORT-FITTINGS, MAINS, AND GENERAL CAST AND WROUGHT IRONWORK.

Catalogues, New Book of Testimonials, and full Particulars on Application.

Wellington, Nelson, and Market Street Works, KEIGHLEY, YORKS.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Feb. 5, 1895.